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SUMMER MOVEMENTS OF BLACK SWIFTS IN RELATION TO WEATHER CONDITIONS

By MIKLOS D. F. UDVARDY

During the summers of 1952 and 1953, the Black Swift (*Nephoecetes niger borealis*) was recorded on the campus of the University of British Columbia in Vancouver and occasionally also at other localities in the province. I made continuous observations from June 1 to August 1, 1952, and April 20 to May 15 and July 15 to August 20, 1953. During my absences from Vancouver, Mrs. D. H. Speirs and Messrs. M. Keenleyside, K. Racey, G. W. Smith, J. M. Speirs and G. J. Spencer kindly noted occurrences of the Black Swift on the observation area. I am indebted to them for their collaboration. From August 1 to September 1, 1952, and from May 15 to July 15, 1953, I made regular observations at Departure Bay, close to Nanaimo. The few swifts noted in Nanaimo are included in the following list.

Table 1 summarizes the occurrence of the swift together with some meteorological data. These data are compiled from the monthly meteorological summaries of the Vancouver International Airport, from the daily weather reports of the Meteorological Division, Canada Department of Transport, and from similar reports of the United States Weather Bureau, Washington, D. C.

DISCUSSION

The appearance of the swifts seemed to coincide remarkably with such prominent weather conditions as barometric pressure, wind direction and precipitation. Table 1 indicates that these conditions were quite uniform at the time of the summer appearance of the Black Swift in Vancouver. Of the 21 days when swifts were seen, 17 had low pressure, 16 had SE-E prevailing wind, and there was rain, at least in traces, on 20 days.

The coincidence is still more striking if we compare these weather factors during the months when swifts were most frequently seen, that is, June, 1952, and June, 1953. Table 2 shows that swifts were seen only exceptionally on days of high air pressure, westerly wind and fair, dry weather. Of the 60 days considered, 15 days had the combination of low pressure, E-SE wind and rain; swifts were noted on 10 of these days. While these 15 days comprise 25 per cent of the period considered, 67 per cent of the swift occurrences were noted on these days.

Low pressure, with prevailing E-NE wind, and rain is well known to the meteorologist as well as to the naturalist in the northern temperate hemisphere. This is one phase of a cyclone passage. Warm, high-pressured air masses meeting cold ones of low pressure cause a counter-clockwise air circulation on a wide scale, resulting in a cyclone which moves southeastward. From the general direction of the air circulation in the cyclone it is evident that E-SE winds prevail in front of its passage. The warm air penetrates from the S-SW and is usually preceded by areas of cold air, by SE wind and by precipitation in the SE sector of the cyclone. The weather reports during a summer month demonstrate that our summer weather is an alternation of cyclone passages and

Table 1

Observations of the Black Swift at Vancouver, B. C.*

Date	Rain	Prevailing direction of the wind	Barometric pressure	Number of swifts observed	Remarks
1952					
June 3	+	SE	L	8–10	
4	+	SE	L	8–10	
10	+	SE	L	100	
11	+	NW	L	1000+	
12	+	E	L	200+	
15	+	S, W	H	10	
16	+	SE	L	20	
20	+	SE	H–L	120+	
26	+	SE	H–L	300–400	
27	+	SE	L	150–200	
July 21	–	E	L	500	
22	+	SE	L	100	
23	+	SE	L	100+	
24	+	SE	L–H	200	
August 22	+	SE	L	30–40	Observed by MK
1953					
April 26	+	E	L	A few	Observed by GS
June 6	+	E	L	8–12, 4*	Observed by GJS; Departure Bay, obs. by DHS, JMS, MDFU
7	+	SE	L	37, 4*	Obs. by KR; Dept. Bay, obs. by MDFU
8	+	SE, NW	L	200+, 1*	Obs. by KR; Dept. Bay, obs. by DHS, JMS, MDFU
13	+	E	L	200+	Obs. by GJS
21		NE	H	3*	Courteney, obs. by DHS
22		NE	H	2*	Dept. Bay, obs. by JMS
24	+	NE	H	12, 12*	Obs. by DHS; Dept. Bay, obs. by JMS, MDFU
28	+	E	L	10–12*	Dept. Bay
July 1	+	E	L	3*	Englishman River, obs. by JMS
August 6	+	SE	L	4–5	
October 1	–	SSE	L	6–7	

* The swift numbers not marked with asterisks refer to observations at Vancouver, B. C.

stable, good weather of high air pressure (anticyclone). In the Vancouver area the passage of the cyclone with its cold, rainy spell is usually accompanied by E or SE wind, depending on how far N or S the center of the cyclone passes by the area.

One representative day of each season (figs. 1 and 2) has been chosen to illustrate such a cyclone passage. Between July 21 and 23, 1952, several hundred swifts passed by and foraged over the university campus in Vancouver. Figure 1 shows that on July 22 Vancouver was NE of a warm front, completely overcast, and that it was raining. About 100 swifts were observed. Figure 2 shows the weather map for 1:30 p.m. on April 26, 1953. A center of low pressure was approaching, and the area of precipitation preceding the warm front had reached the SW coast of Vancouver Island. In the afternoon an east wind predominated with rain in the Vancouver area and this typical cyclone passage brought up the first Black Swifts of the year. This arrival seems quite early, since Rathburn (1925) says, for Seattle, that the swifts are back only in May, coinciding with "a spell of foul weather." In general, the dependence of spring arrival of migrants on particular weather situations is a well known phenomenon in the ornithological literature (Cooke, 1913, etc.). Cyclones as proximate releasers of spring

return flight have been shown for several species, as for the European Swift (*Apus apus*) into Hungary (Lovassy, 1894).

The appearance of the Black Swift at localities where it does not breed, and its coincidence with rainy, bad weather, is noted in life history accounts of that species. In fact, one of the first observations of the Black Swift in British Columbia was made on "a foggy day early in June" (Lord, 1866). Rathburn (1925), Swarth (1922) and after them Bent (1940) quote several such coincidences.

Table 2

Some Weather Factors and the Appearance of Swifts

	Number of days with									
	Barometric pressure			Prevailing wind direction				Days of precipitation		
	Low	High	Alternating	SE	E-NE	W-SW, NW	Changing, no wind	With	Without	Totals
June, 1952	14	14	2	10	5	13	2	14	16	30
Swift noted	8	1	1	7	1	1	1	10	....	10
June, 1953	13	15	2	7	15	6	2	20	10	30
Swift noted	4	1	....	1	3	....	1	5	....	5
Total of 60 days	27	29	4	17	20	19	4	34	26	60
Swift noted	12	2	1	8	4	1	2	15	....	15

These data and the above observations appear in a new light if we compare them with observations of the European Swift. Among all the North American swifts, the Black Swift appears to be closest related to this common European species, resembling it in appearance and habits. Recently accumulated observations and systematic physiological experimentation have explained the peculiar habits of the latter in relation to the weather. This swift was long ago considered a weather prophet indicating summer storms by its appearance at localities where it does not breed. I mention as an outstanding example its summer movements through the Swedish bird station at Ottenby (Swärdson, 1950). During July of three years, out of 93 observation days, southbound swifts passed by the southern point of Oland island on 87 days. When cyclonic weather was extended over all Scandinavia, numbers up to 30,000 were observed daily at the bird station.

Koskimies (1947, 1950) gives a plausible explanation of these cyclone movements of the swift. The air masses in front of a cyclone are cool, the wind grows stronger and insect life in the air where the swift hunts becomes scarcer. These circumstances continue while the cyclone approaches and are accompanied by rain. The warm sector of the cyclone, on the other hand, may carry large numbers of aeroplankton as shown by Palmén (1944) who studied the anemochor distribution of the insects. Headed against the wind, the swift flies across the cold air masses and arrives in the southern, southeastern sectors of the cyclone where—even if it still rains—there are more flying insects.

Apparently the juvenal, nonbreeding European Swift as well as most of the breeding adults leave their summer residences when the worst cyclonic condition is about 250–300 miles from them. Flying against the wind, they avoid the cooling down and starvation. Presumably drifting insect masses stimulate them to turn south against the insect-carrying warm winds. When the cyclone passage is over, they return to their nests or residence again by flying against the wind, which in the back of the cyclone is mainly northerly.

The experimental part of Koskimies' study establishes the fact that the nestling

swift may survive the period of starvation and cold while its parents are away during the cyclone passage by reversible, temporary torpidity (Koskimies, 1948, 1950). During cold nights the body temperature of a starving swift nestling drops close to the level of the air temperature. By thus reducing metabolism, loss of body weight by starvation is greatly diminished. Even an adult swift is capable of such torpidity if overcome by cold weather. This behavior of the European Swift is highly adaptive. The swift forages only on wing, and cool cyclonic weather causes the aeroplankton to disappear. In such

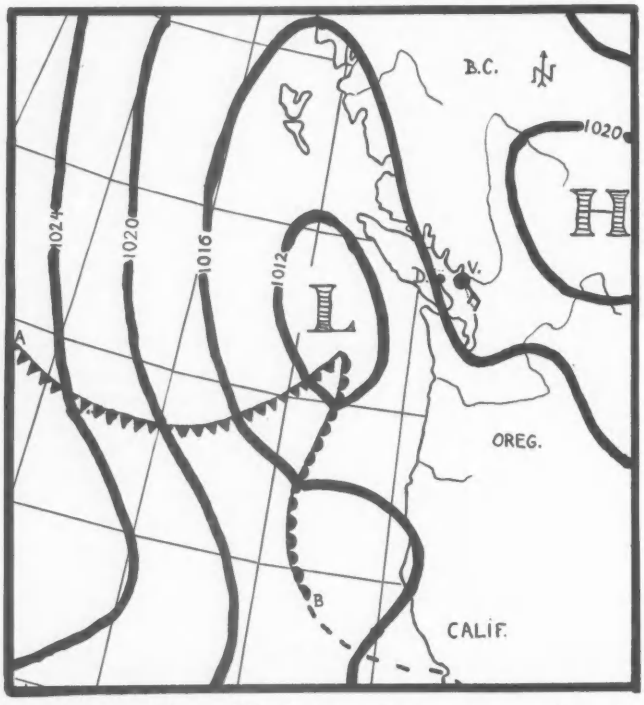

Fig. 1. Weather conditions on July 22, 1952, at 6:30 p.m., from the daily weather map of the Meteorological Division, Canada Department of Transport. Isobars in millibars. A, cold front; B, warm front; H, high pressure center; L, low pressure center; D, Departure Bay; V, Vancouver, with direction and strength of wind indicated.

circumstances swifts of different species have been found dead in or around their breeding places, and naturally their young have succumbed, too. The young swift stands experimental starvation up to nine days while the tolerance of the adult is much less. Thus, avoiding the cyclone by abandoning nest and young gives a fair chance of survival to both age classes if bad weather conditions do not last too long.

This torpidity—or partial poikilothermy—is apparently similar to that just discovered and studied in hummingbirds and in caprimulgids (Huxley, Webb and Best, 1939; Culbertson, 1946; etc.). These families are related to the swifts. A similar phenomenon

may occur in other swifts not yet studied systematically in this respect. For example, Bartels (1931) mentions adults of the Alpine Swift (*Apus melba*) which disappeared during periods of rain or, when found at roosts, were conspicuously tame and slow. Hanna (1917) states that the White-throated Swift (*Aëronautes saxatalis*) wintering in California are found in the coldest weather "within the rocks, in a dormant state." McAtee (1947) states that torpidity has been found even in the Chimney Swift (*Chaetura pelagica*).

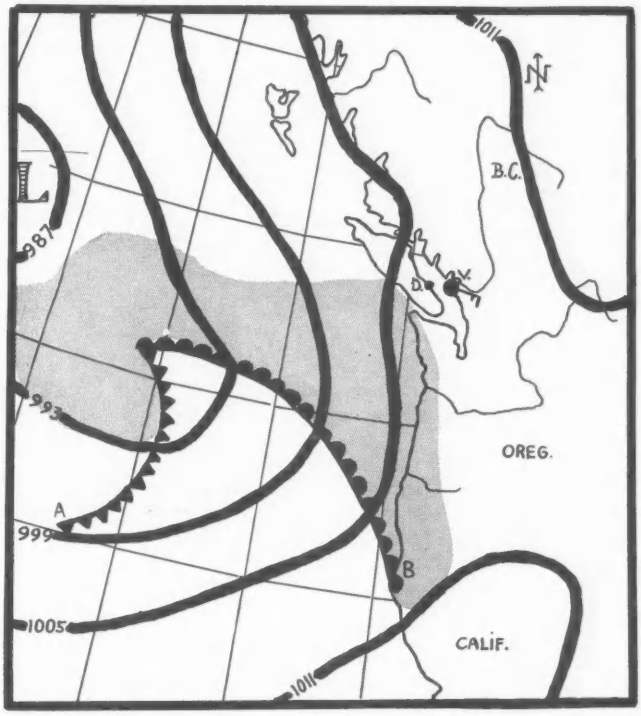

Fig. 2. Weather conditions on April 26, 1953, at 1:30 p.m., from daily weather map of the United States Weather Bureau. Area of precipitation shaded. Other symbols as in figure 1.

No observations were made at the breeding places of the Black Swift to determine whether or not they leave the breeding area periodically. Neither is its physiology or metabolism known. However, its regular appearance coinciding with the typical cyclone passages in the coastal areas of British Columbia indicates that its habits are very similar to those of the swifts of Europe.

The relation of the Black Swift to the weather permits some speculation as to the origin of the swift "swarms" which appear at times in Vancouver. For example, on June 11, 1952: about 1000 were seen; on July 21, 1952: about 500–600; "June 8, 1953. Cloudy and cool. Many hundreds circling . . . " (K. Racey, *in litt.*); "June 13, 1953,

Black Swifts thinly distributed as far as the eye can see" (G. J. Spencer, *in litt.*). No breeding data on swifts are recorded for the Lower Fraser Valley. However, the local ornithologists suspect nesting in the mountains of the Coastal Range, north of Vancouver, surrounding Howe Sound (I. McT. Cowan and K. Racey, orally). Even if this is so, the large numbers observed on several occasions indicate that this cannot be a gathering from the nearby valleys, but must be the swift population of a considerable area. Since swifts fly into the wind, I think this area would lie northwest from Vancouver—beginning with either side of the northern part of Georgia Strait and then Johnstone Strait. More detailed speculation is not safe since the data collected are few (about 12 cyclone passages in the two summers) and I was unable to determine the main direction of the swifts' flight, although it appeared to be NNW-SSE.

It would be desirable if future observers in the northern Pacific area would concentrate on summer appearances of the Black Swift. Notes on the number of swifts observed, if possible their flight direction, occurrence of rain or fog, records of temperature change, and wind direction would give the necessary information. These data when coordinated with the maps of the meteorologists would allow calculations as to the origin of the swifts. The European example indicates that the swift journeys in summertime may extend to areas several hundred or even more than a thousand miles from the breeding localities and that swifts easily fly these distances in two or three days.

SUMMARY

Observations of summer occurrences of the Black Swift at Vancouver, British Columbia, and vicinity are analyzed with respect to weather conditions. It was found that in most cases the appearance of swifts coincides with a cyclone passage, and very often in the southeastern sector of the cyclone. The recent literature pertaining to movements and physiology of the related European Swift is reviewed. The author believes that the summer movements of the Black Swift are similarly governed and that the type and magnitude of migration may be of the same order. Comparisons of the weather conditions suggest that the swift swarms accumulate from a wide area, lying not necessarily close to the point of observation.

LITERATURE CITED

Bartels, M., Jr.
1931. Beobachtungen an Brutplätzen des Alpenseglers, *Micropus melba melba* (L.). Jour. f. Orn., 79:1-28.

Bent, A. C.
1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. U. S. Nat. Mus. Bull. No. 176.

Cooke, W. W.
1913. The relation of bird migration to the weather. Auk, 30:205-221.

Culbertson, A. E.
1946. Occurrences of poor-wills in the Sierran foothills in winter. Condor, 48:158-159.

Hanna, W. C.
1917. Further notes on the white-throated swifts of Slover Mountain. Condor, 19:3-8.

Huxley, J. S., Webb, C. S., and Best, A. T.
1939. Temporary poikilothermy in birds. Nature, 143:683.

Koskimies, J.
1947. On movements of the swift, *Micropus a. apus* L., during the breeding-season. Ornis Fennica, 24:106-111.
1948. On temperature regulation and metabolism in the swift, *Micropus a. apus* (L.), during fasting. Experientia, 4:274-276.
1950. The life of the swift, *Micropus apus* (L.), in relation to the weather. Annal. Acad. Scient. Fennicae, Ser. A, IV(15):151 pp.

Lord, J. K.
1866. The naturalist in Vancouver Island and British Columbia. Vol. 2.

Lovassy, A.
1894. Die Ankunftszeiten der Mauersegler (*Cypselus apus* L.) in Nagyröcze. Aquila, 1:47-48.

McAtee, W. L.
1947. Torpidity in birds. Amer. Midl. Nat., 38:191-206.

Palmén, E.
1944. Die anemochore Ausbreitung der Insekten als zoogeographischer Faktor. Annal. Zool. Soc. Zool.-Bot. Fenn. Vanamo, 10(1):262 pp.

Rathburn, S. F.
1925. The black swift and its habits. Auk, 42:497-516.

Svärdson, G.
1950. Swift (*Apus apus* L.) movements in summer. Proc. Xth Internat. Orn. Congr. Uppsala, pp. 335-338.

Swarth, H. S.
1922. Birds and mammals of the Stikine River region of northern British Columbia and southeastern Alaska. Univ. Calif. Publ. Zool., 24:125-314.

Department of Zoology, University of British Columbia, Vancouver, B.C., March 30, 1954.

VARIATION IN BREEDING SEASON AND CLUTCH SIZE IN SONG SPARROWS OF THE PACIFIC COAST

By RICHARD F. JOHNSTON

In its distribution along the Pacific Coast of North America the Song Sparrow (*Melospiza melodia*) spans about 36 degrees of latitude, from 26°N to 62°N, and ranges altitudinally from sea level to more than 8000 feet. These features of its distribution make the Song Sparrow well suited to a study of its breeding season and clutch size in relation to the climatic conditions prevailing in this region. The data on breeding are examined from the standpoint of increasing latitude and elevation, as this is a convenient way in which to generalize any large-scale variation related to climate.

The raw data on which this report is based consist of 545 records. Most of the data accompany egg sets in oological collections and pertain to locality, date of collection, clutch size, and state of incubation. These records are taken, in large part, from the collection at the Museum of Vertebrate Zoology or from the files of the San Francisco Bay Region Nesting Survey of the Cooper Ornithological Society. Additionally, there are complete, long-term field data for 90 records of *M. m. samuelis* from a salt marsh on San Francisco Bay in Contra Costa County, California. Other records were obtained from I. McT. Cowan, E. N. Harrison, A. P. Marshall, E. Z. Rett, L. B. Silveira, and R. B. Williams, all of whom I thank sincerely. A few records were obtained from Howell (1948:358), Grinnell (1909:230), and Willett (1912:84; 1933:185). I wish to thank Alden H. Miller and Frank A. Pitelka for generous help given me in the preparation of this report.

Table 1 presents a list of the several groups of birds considered here according to general location and size of the sample. The latitudinal groupings reflect in some cases

Table 1

Location and Sample Size of Breeding Groups of Song Sparrows

Group	Latitudinal limits in °N	Number of records	
		Breeding	Clutch size
Baja California	30	.....	124
Southern California (*cooperi*)	32–36	113	84
South-central coastal California (*gouldii*)	36.6–37.5	126	86
San Francisco Bay salt marsh (*pusillula*)	37.5	51	48
San Francisco Bay salt marsh (*samuelis*)	38	134	119
North-central coastal California (*gouldii*)	37.5–39	175	143
Oregon-Washington	41–50	43	26
Sierra Nevada (*fisherella*)	37–39	32	32
Alaska	52–62	20	17

the boundaries of morphological races of Song Sparrows on the Pacific coast, and when this is so the name of each race is given. The racial names may refer to real groups, but they do not imply that specimens were taken and identified racially for this study. The racial taxonomy used here is that of Marshall (1948:255).

The dates presented here represent the date of completion of the clutch for each record. Except for field records for which laying or hatching was under observation, the method of figuring the date of completion of the clutch was essentially that of Lack (1946:99), assuming an incubation period of 12 days for all forms of the Song Sparrow discussed here. Thus, a number of days was subtracted from each record according to the given state of incubation; in those cases for which the state of incubation was not indicated six days was subtracted from the record.

The data for a few of the groups were gathered over more than fifty years, through great variation in annual weather conditions, and it may be assumed that approximate extreme dates are represented. In my experience early dates are fairly readily determined for Song Sparrows, but the end of the nesting season is difficult to note, the few late nesting individuals being able to escape detection in the heavy vegetation of July. Therefore, of the extreme dates cited here, the late dates are more probably subject to error.

Certain shortcomings of oological collections have been noted by Lack (1946:99). These consist generally of an inconsistency in the time of collecting and a favoritism for the larger clutches obtainable in mid-season. I have assumed that bias introduced in this manner is minimal since most of the collectors whose material is used here were usually active throughout the season and collected all complete sets of eggs that were found, regardless of the size of the clutch.

BREEDING SEASON

Length.—The data indicating the span of the breeding season are summarized graphically in figure 1. From south to north the season starts progressively later and concomitantly becomes shorter. In southern California the season may start by the second week in February and extend for some five months, and 500 miles north it may start one month later and extend for only three and one-half months. Under more severe climatic conditions the season may extend for but ten weeks, as in the Sierra Nevada, or for about seven weeks, as in the Alaskan Peninsula and Aleutian Islands.

Peak.—Each of the groups shown in figure 1 may be said to have a clear breeding peak or peaks. North from latitude 36°N the peaks occur later in time, and, with the compression of the season, tend to cluster more closely about a modal date. The later peaks of the populations in southern California (*cooperi* and south-coastal *gouldii*) apparently illustrate a tendency already noted among passerines (Baker, 1938:562); that is, the height of the breeding season occurs later at more southerly latitudes than at middle latitudes, although the beginning of the season stretches earlier into the year the lower the latitude. The Song Sparrow race *rivularis* in Baja California at latitude 26°N also has a late peak; according to Bancroft (1930:36) the height of the season is in late April and May.

The earliest nesting peaks are found in the salt marsh races *pusillula* and *samuelis* on San Francisco Bay. It seems possible that these early nesting peaks represent an adaptation to salt marsh conditions since they occur more than two weeks earlier than the peaks for upland populations (*gouldii*) at identical latitudes and coincide with the neap tides of late March and April. With the bulk of the populations nesting during these low tides, the birds, which must nest close to the ground surface, lose a negligible percentage of eggs and young due to flooding by tidewater.

The north-coast populations of *gouldii* and the birds in Oregon and Washington show what are apparently two nesting peaks. This is probably a reflection of chance variation in small samples; at least larger samples would be necessary before any significance could be attached to the two peaks.

CLUTCH SIZE

Latitudinal variation.—Song Sparrows of the Pacific coast show an increase in mean clutch size with an increase in latitude (table 2) and thus with a decrease in length of season and number of broods. Particularly striking is the fact that the incidence of five-egg clutches north of 40°N is about 25 per cent, whereas south of 40°N it is about 2 per cent. Few clutches of five eggs have been recorded south of 36°N. The popula-

tions in the Sierra Nevada are similar to the more northerly, coastal ones and produced the only six-egg clutch recorded in the data presented here.

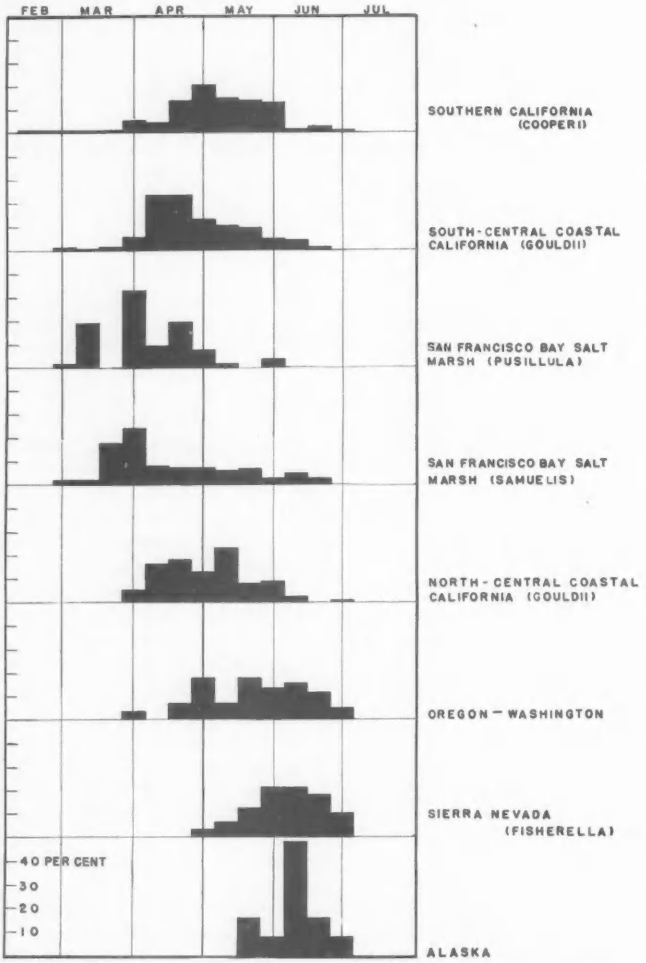

Fig. 1. Breeding seasons, as shown by frequency of completed clutches, in several populations of Song Sparrows of the Pacific Coast. The vertical columns represent 10-day periods, with the 1st, 10th, and 20th of each month as medians.

The small mean clutch size of 3.3 eggs for the birds of the San Francisco Bay salt marsh falls considerably out of the gradient of increasing clutch size in the northward progression. Since two distinct salt marsh populations show this low average it is apparently not the result of chance; rather the indications are that it is adaptive, as Lack's

Table 2

Clutch Size in Song Sparrows of the Pacific Coast

Group	First clutches	Second clutches	Mean clutch size
Baja California	------	------	3.05
Southern California (*cooperi*)	3.74	3.58	3.69
South-central coastal California (*gouldii*)	3.61	3.77	3.71
San Francisco Bay salt marsh (*pusillula*)	3.25	3.40	3.31
San Francisco Bay salt marsh (*samuelis*)	3.10	3.40	3.28
North-central coastal California (*gouldii*)	3.47	3.56	3.53
Oregon-Washington	3.65	4.00	3.81
Sierra Nevada (*fisherella*)	3.90	4.00	3.99
Alaska	4.00	4.33	4.17

analyses of clutch size phenomena indicate. More difficult to understand is the relatively low value, again deviating from the overall gradient, which is recorded here for the northern populations of the race *gouldii*.

Longitudinal variation.—It has been shown previously (Lack, 1947*a*:307) that clutch size increases interiorward over a continental mass. In Song Sparrows at Columbus, Ohio, the average clutch size is 4.15 eggs (Nice, 1937:108), about 0.5 egg higher than at comparable latitudes in non-montane California.

Seasonal variation.—In the salt marsh race *samuelis*, 90 records collected over a four-year period (1950–1953) show a clutch size of 3.1 eggs from the start of the season to April 5, 3.4 from April 6 to May 15, and 3.1 from May 16 to the end of the season. Similar variations in other passerine birds have been chronicled by the Lacks (1947*b*, 1950) and others. All other populations of the Song Sparrow treated in table 2 except those in southern California show a lower mean clutch size for first nestings than for all subsequent nestings through the season; the difference is of the order of 0.2 egg. For these other populations the expected drop-off at the end of the season is not apparent.

BIOCLIMATIC CORRELATION

As indicated above, north of latitude 33° N there is a general and relatively constant retardation in the date of beginning of egg-laying of the Song Sparrow. The retardation seems to conform to the bioclimatic law of Hopkins, a scheme carefully erected to describe the general retardation in biological growing season that occurs with increase in latitude and elevation on all continents. Specifically, the law (Hopkins, 1938:9) states that there is a retardation in season of four days for each increasing degree of latitude, for each five degrees of longitude eastward over a continent, and for each 100 to 125 meters rise in elevation from a given base.

At this point it is pertinent to note that the several investigators of bioclimatics have never agreed as to the absolute length of the seasonal retardation-time coordinates of the altitudinal, latitudinal, and longitudinal components of their "laws." This is due not only to the fact that there were several workers but doubtless also to the resistance of such a complex ecological phenomenon to being rigidly categorized. The various figures of retardation run from 2.75 to 4.87 days (Hopkins, 1938:8). Therefore, in calculating the expected retardation for various localities as shown in table 3 I have given the expectation for both three and four days. Also, in figuring the expected retardation for the station in the Sierra Nevada the expectation is based on three to four days for each 112 meters rise in elevation.

It will be further noted that the few early dates for inception of breeding rather than the later ones when more general breeding is started in the population were used

in the arithmetic here; the early dates have the advantage of being more objective, lending themselves better to work of this kind, although they may be possibly less important in nature. In addition, since south of about 36°N the date of inception of general laying occurs later than at middle latitudes those time intervals when most breeding is started would be impossible to use as a basis on which to test bioclimatic relations. But, north of 36°N the relation to climate holds for both the earlier dates and those intervals when most of the breeding is started.

Table 3

Seasonal Retardation and Bioclimatic Correlation of Breeding in Song Sparrows

Station (lat. °N, long. °W)	Elevation	Early date	Retardation in days	
			Actual	Expectation
33, 117.5	.....	Feb. 10	....	.....
38, 122.5	.....	Feb. 26	16	15–20
39, 120	2000m	Apr. 27	76	72–96
40, 83	220m	Apr. 13	62	48–64
48, 120	.....	Apr. 1	50	45–60
58, 135	.....	May 19	98	75–100

Using all samples, and on the basis of the earliest dates for all localities concerned, the figures in table 3 show that the inception of breeding in the Song Sparrow is retarded about three days for each 100 to 125 meters rise, up to 2000 meters (6200 feet) elevation in the Sierra Nevada, and for each degree of latitude to 38°N, about three and one-half days for each degree to 48°N, and about four days for each degree to 58°N. These results seem to support the bioclimatic generalizations of Hopkins.

As a check on the existence of the "longitudinal retardation" of three to four days for each five degrees of longitude, an interior population at Columbus, Ohio, is found to show a retardation of 62 days, with an expectation from the bioclimatic law of 48 to 64 days (table 3). Since there are no data at hand for stations lying between California and Ohio it is not possible to say whether this correspondence represents part of an overall continental gradient or is sheer coincidence. It is, however, suggestive, and indicates a need for additional investigations of breeding in the Great Plains regions.

Other investigators have found reasonably similar retardation in breeding of birds. Baker (1938) in his survey of latitudinal influences on breeding seasons found a two to three day retardation per degree of increasing latitude in a great number of birds breeding from middle latitudes to the subarctic. Kessel (1953) noted a retardation in breeding of three days per increasing degree of latitude in the Starling (*Sturnus vulgaris*) along the Atlantic coast of North America.

With regard to the handling of the present data it is well to note that although Hopkins allowed for correction factors depending on the edaphic and physiographic nature of the stations under consideration, for the majority of the localities treated here it was not possible to obtain precise information. It will also be noted that no correction for longitude was made for stations running north along the Pacific coast line; I felt that to have done so would not have been a realistic interpretation of Hopkins' rule, for there is no progression eastward across a continental mass in spite of the 17 degrees of longitude difference between Juneau, Alaska, and Encinitas, California.

SUMMARY

1. The breeding season in Song Sparrows is shorter and starts later in the year at higher latitudes as compared with lower latitudes.

2. The peak of the breeding season is earliest at middle latitudes, intermediate at lower latitudes, and latest at higher latitudes.

3. Clutch size increases with increasing latitude, increasing altitude, and decreasing longitude over the North American continent.

4. In at least one race of Song Sparrow (*samuelis*), clutch size is smaller at the beginning and end of the season and larger in the middle.

5. Inception of breeding in Song Sparrows is retarded by three to four days for each degree increase in latitude, each 100 to 125 meters rise in elevation, and probably also for each five degrees decrease in longitude over a continental mass. Thus, in its breeding this species conforms to some set of natural forces subsumed by the bioclimatic law of Hopkins.

LITERATURE CITED

Baker, J. R.
1938. The relation between latitude and breeding season in birds. Proc. Zool. Soc. London, 108(A):557-582.

Bancroft, G.
1930. The breeding birds of central Lower California. Condor, 32:20-49.

Grinnell, J.
1909. Birds and mammals of the 1907 Alexander expedition to southeastern Alaska. Univ. Calif. Publ. Zool., 5:361-428.

Hopkins, A. D.
1938. Bioclimatics, a science of life and climate relations. U. S. Dept. Agr. Misc. Publ. 280:iv +188 pp.

Howell, J. C.
1948. Observations on certain birds of the region of Kodiak, Alaska. Auk, 65:352-358.

Kessel, B.
1953. Distribution and migration of the European Starling in North America. Condor, 55:49-67.

Lack, D.
1946. Clutch and brood size in the robin. Brit. Birds, 39:98-135.
1947*a*. The significance of clutch-size. Ibis, 89:302-352.
1947*b*. Further notes on clutch and brood size in the robin. Brit. Birds, 41:98-104, 130-137.

Lack, E.
1950. Breeding season and clutch size of the wood warbler. Ibis, 92:95-98.

Marshall, J. T., Jr.
1948. Ecologic races of song sparrows in the San Francisco Bay Region. II. Geographic variation. Condor, 50:233-256.

Nice, M. M.
1937. Studies in the life-history of the song sparrow. I. Trans. Linn. Soc. N. Y., 4:vi+247 pp.

Willett, G.
1912. Birds of the Pacific slope of southern California. Pac. Coast Avif., 7:122 pp.
1933. A revised list of the birds of southern California. Pac. Coast Avif., 21:204 pp.

Museum of Vertebrate Zoology, Berkeley, California, March 30, 1954.

COMPARATIVE NOTES ON FUERTES AND ORCHARD ORIOLES

By RICHARD R. GRABER and JEAN W. GRABER

In March of 1888, W. B. Richardson collected and preserved what was probably the first scientific specimen of the American oriole which was later named *Icterus fuertesi* by Chapman (1911). This first specimen was not discussed critically, oddly enough, until 1939 (Sclater, 1939:142). Wetmore (1943:323-324), reporting on specimens collected by Carriker, added to our knowledge concerning the size and distribution of *fuertesi* and hinted that it might actually be a race of the Orchard Oriole (*Icterus spurius*). Blake (1953:512) thus chose to regard it, although little more was known of the bird and its habits than when Chapman's description appeared.

We had opportunity to make observations on the Fuertes Oriole during the course of our work along the coast of Tamaulipas in the summer of 1953. In presenting our data on *fuertesi*, we have included a comparison between it and *spurius*.

DISTRIBUTION

The breeding range of *Icterus fuertesi* extends, as Wetmore (1943:324) pointed out, along the eastern coast of Mexico from southern Tamaulipas to at least Tlacotalpam in southern Veracruz. Its wintering grounds are apparently unknown. On the Tamaulipas coast, we found that Fuertes Orioles bred at least as far north as Moron, where they were fairly common.

Whether or not the Orchard Oriole actually breeds in Mexico, except near the United States border, still seems to be a moot point. The occurrence of that species in Mexico in the summer months cannot be considered as evidence of breeding, as migrants may occur in May and July even in southern Mexico. From our experiences in the Tampico region in June, we feel quite certain that *spurius* does not breed in that area, whereas *fuertesi* is a common bird. Whether the ranges of the two forms overlap farther to the north, we did not learn. We left the Tampico region on June 28, and went to Moron which lies only 35 miles to the north. Near Moron, we found Orchard Orioles, but not until July 3, when we saw an adult male with six female or immature individuals. On July 4, we saw an adult male *spurius* (typically dark chestnut-colored) which sang as we watched it; then we lost sight of it and did not see it again. Perched within 25 yards of this *spurius* was an adult male *fuertesi*, also singing. We collected the latter and found that it had much enlarged testes. Like five other singing males of the same form which we saw in the vicinity, it was probably holding a breeding territory. It was over two weeks before we saw another Orchard Oriole, and then not individual birds but non-singing, obviously transient flocks of both sexes.

Thus, the lone male *spurius* we saw on July 4 may possibly have been a breeding bird, in which case the two forms come together in the Moron region. Although the singing is hard to account for, we are inclined to the view that the bird was an early transient. Warner and Mengel (1951:294) found transient flocks of *spurius* as early as July 16 near Boca del Rio, Veracruz, and the group which we saw on July 3 could well have been a transient flock.

HABITAT

The Fuertes Oriole is concentrated in a distinct habitat—the narrow belt of dune vegetation along the coast (fig. 1). This habitat is an extremely well lighted one with whitish sand and salt flats on all sides. Nesting pairs were especially numerous in the dense, sprawling clumps of majagua or hibiscus (*Hibiscus tiliaceus*) and mangle negro (*Conocarpus erecta*) just behind the dunes, within 15 to 20 paces of the waters of the Gulf. We found at least one nesting pair in nearly every clump. The species' breeding grounds

must originally have been restricted to this narrow, semi-marshy, unforested trough. Fuertes Orioles have probably invaded more inland parts of the coastal plain only in recent years, due to increased deforestation, especially along man's transportation routes, such as rivers and highways. This is indicated by the aggregation of nesting *fuertesi* in the dunes habitat. We found the population considerably less dense around Altamira (only 6 to 8 miles inland) where the orioles occur in scattered pairs in "hedge rows" at the margins of cultivated fields and in scrubby thorn thickets of bull's horn

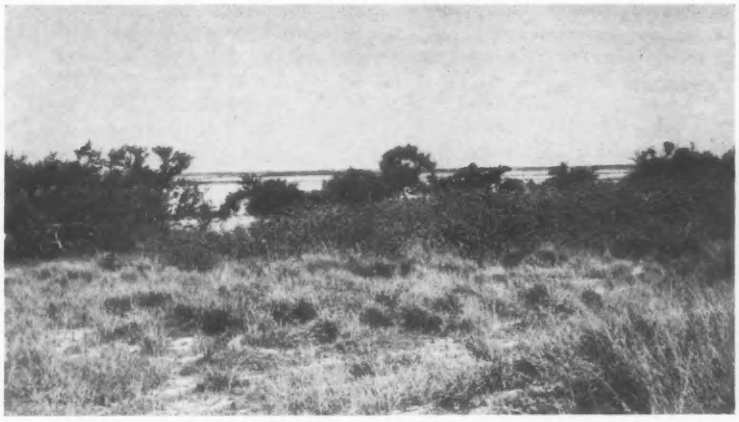

Fig. 1. Habitat of Fuertes Oriole, one mile east of Loma del Real, Tamaulipas. Dune grass in foreground, then hibiscus and mangle negro shrubs, and then a row of mangle trees (*Avicennia nitida*); salt flat in background; photo taken looking inland (westward).

acacia (*Acacia* sp.) and other plants. The spread is further pointed out by the fact that Nelson and Goldman (Goldman, 1951:259) apparently did not find this oriole in the vicinity of Altamira during their visit for 28 days in April and May of 1898, when that region was better forested. It is true that Chapman's type series came from 35 miles inland along the Tamesi River, but both the date of his observations (early April) and the fact that there were transient flocks of Orchard Orioles about indicate that his *fuertesi* may have been transients where he found them.

Pearson, Brimley and Brimley (1942:335) and Dennis (1948:15) mentioned the preference of *spurius* in the states of North Carolina and Mississippi for the coastal lowlands. Thomas (1946) and others have pointed out the semi-colonial nesting habits of the Orchard Oriole. Our experience in Kansas leads us to believe that these birds do not always aggregate in certain favored localities but also nest in scattered single pairs.

Our data corroborates Beecher (1950:78) in his assumption that the habitat requirements of *fuertesi* are essentially like those of *spurius*. Judging from the denseness of the population of *fuertesi* along the coast, and the fact that additional suitable habitat is being made available, this species may become one of the commonest forms throughout the coastal plain of eastern Mexico, just as *spurius* has in the eastern United States.

MIGRATION

The migration periods of *spurius* and *fuertesti* apparently coincide to some extent, in both spring and fall, but at least in the fall that of *spurius* starts earlier and continues

later in southern Tamaulipas. This is possibly a natural consequence of greater numbers and broader range. In July when the first individuals of *spurius* came southward down the coast through the area occupied by the population of *fuertesi*, the latter were for the most part still occupied with the care of young birds, many of which were already out of the nest. On July 24, when we left the coastal area, some Fuertes Orioles were still feeding young birds, although all we saw were out of the nest and fairly well grown. Adults were still not in flocks, and we occasionally saw a male singing. Flocks of Orchard Orioles were evident on all sides, migrating in earnest. When we returned to the region again on August 23, flocks of *spurius* were still evident, but we saw only one individual of *fuertesi*, and none thereafter. August 26 was our last day in the field, and on that date we identified *spurius* but no *fuertesi*. It should be emphasized that only adult males of the two forms could be identified in these transient flocks.

BREEDING BEHAVIOR

In general, breeding behavior of orioles of the genus *Icterus* does not vary greatly, and one would expect two forms as similar in appearance and habitat requirements as *spurius* and *fuertesi* to be similar in other respects. Such, in our experience, proved to be the case.

Like the migration period, that of nesting must correspond quite closely in *spurius* and *fuertesi*. Lloyd (1887:290) stated that Orchard Orioles (males) arrived in western Texas about April 13, and his earliest dates for nests with eggs were May 19 and June 1. He also stated that males were not seen after August 5 while females (or young of the year) were seen as late as mid-September. Dennis (1948:13) gave March 28 as the arrival date for males in Mississippi, stating that nest-building began about May 1 and that the last nest under construction was observed July 4.

Forbush (1927:439) indicated that *spurius* was single-brooded, at least in the northern part of its range. Dennis (*op. cit.*) showed that one complete nesting cycle of the Orchard Oriole in Mississippi required slightly over a month. We believe that Fuertes Orioles are also generally single-brooded, since the numbers of stub-tailed juveniles which we saw in late June in southern Tamaulipas probably represented the first broods of the bulk of the *fuertesi* population in that region, and by August 20 virtually all of the adult orioles had migrated.

On June 17, we visited the dunes habitat east of Loma del Real, where we saw several Fuertes Orioles. Thereafter, between Tampico and Loma del Real we saw dozens of these birds and found five active nests between June 18 and 25. We also saw several pairs which were feeding stub-tailed young out of the nest during this time. All of the nests also contained young birds, indicating that the nesting season was well advanced and that the stage of development was consistent in all cases.

Of the five active nests, two were placed in hibiscus shrubs, two in guayaba trees (*Psidium guajava*) 10 to 15 feet in height, and one in the top of a twenty-foot strangling fig (*Ficus* sp.). The nests in the hibiscus were placed high in the shrubs within six inches of the tips of the branches, about eight or nine feet above the sand. They were located about three to five feet in from the margin of the clumps which form rows about five to ten feet wide and 30 to 50 feet long. These nests were well shaded by the large, roughly circular, fairly thick leaves of this shrub. These two nests were less than 50 feet apart, as were the two nests in the guayaba trees. Nests may have been spaced even closer than this, as we once saw two separate pairs carrying food into the same clump, whereas we found only one nest. Occasionally as many as six orioles would scold us at a single clump of vegetation.

The nests were all well-woven baskets, much like those of *spurius*. They were sup-

ported by strands of nesting material wound about adjacent twigs and were cradled in the forks of branches. One of the nests was partly supported by having the nesting material woven through holes in the hibiscus leaves. One such leaf was pulled into contact with the nest wall, a habit which Beecher (1950:61) mentions as being characteristic of the nectar-adapted complex of orioles. This suggests that Beecher may be correct in relating *spurius* to *prosthemelas* through *fuertesi*.

The nests reflected the habitat in that they were made of rather coarse, water-tolerant grasses. One of the two nests which we collected is composed largely of a species of *Eleocharis*, the other of *Spartina* probably. Dennis (1948:15) mentions the use of the latter by *spurius* in the marshes of the Mississippi delta. There was no apparent lining in any of the nests of *fuertesi* that we checked. It was possible to see through the nest walls, but not through the bottom. The absence of lining is of interest since Orchard Orioles even in the southern part of their range generally do use some soft, downy plant materials as nest lining (see Dennis, 1948:15, and Forbush, 1927:439). The nests of *fuertesi* had the same coarse grasses on the inside as on the outside of the nest. This lack of lining may be linked adaptively with the rather high temperatures of the habitat of this bird.

The measurements of the two used nests we collected were 3.5 and 4.5 inches in outside depth, with walls varying from 0.5 to less than 0.25 inch in thickness, being thickest at the bottom. The inside diameter at the top was approximately 2 to 2.5 inches.

As previously indicated, the nesting cycle was already well advanced when we first found these birds, and we failed to find a nest with fresh eggs. A nest found on June 25 contained a nestling only a few days old and an egg which showed no signs of development. The egg measures 0.80 by 0.55 inches, average for *spurius* (Roberts, 1932:307). The markings on the egg are black with a purplish cast, these largely concentrated at the blunt end. In both respects it is similar to eggs of *spurius*. The ground color is white, but that of the eggs of *spurius* is light blue.

Clutch size for the Orchard Oriole is given by various authors as four to six, or generally five. Dennis (1948:19) found a range from two to five in 66 nests, with four of most frequent occurrence. We have no data on clutch size in *fuertesi*, but in the three nests into which we could actually see, there was evidence for no more than two-egg clutches. One held an egg and a bird in natal down; another two nestlings not far from fledging; and the third an oriole in pin feathers and a Red-eyed Cowbird (*Tangavius aeneus*). The latter nearly filled the nest, although it was at about the same stage of development. *Tangavius* is also known to parasitize the Orchard Oriole (see Merrill, 1877:86).

Thomas (1946:166) and Dennis (1948:17) clearly point out that there is virtually no defense of nesting territories by *spurius*. This seems also to be the case with *fuertesi*. Only once did we see one male chase another; otherwise there was no evidence of territoriality. Two males frequently perched and even sang in the same tree. The birds did not appear to range far from the nest site. Although both males and females were active in feeding the young, males seemed to take a more active part in this duty. The birds almost always flew to the low vegetation of the dunes to catch insects. Frequently they flew over the dunes to near the shore for food. Beecher (1950:82) has pointed out that orioles of this type are adapted for nectar feeding. We saw at least one pair flutter before the large, yellow, bell-shaped flowers of *Hibiscus* only a few feet from their nest and probe repeatedly.

In spite of the lateness of the season, Fuertes Orioles were singing rather persistently in late June. Interestingly, Louis A. Fuertes was led to discover the species which bears his name by its distinctive song. Chapman (1911) indicated that the song of *fuertesi*,

although "of the Orchard Oriole type," differed from the song of that species. We had not read Chapman's description previously, but our notes mention the same kinds of differences that Chapman did, that is, that the song of *fuertesi* is softer and less brilliant than that of *spurius*.

Dennis (1948:17) makes note of social nesting between the Orchard Oriole and the Eastern Kingbird (*Tyrannus tyrannus*). A similar relationship may exist between *fuertesi* and the Tropical Kingbird (*T. melancholicus*), as one of the oriole nests we found was only 8 feet directly above an active kingbird nest in the same strangling fig.

COMPARISON OF SPECIMENS

In every instance, mention of *I. fuertesi* in the literature has included mention of *spurius*. This obvious notice of apparent close relationship is to be expected since there is no difference in pattern between the two forms. Chapman (1911:2-4) indicated that there was a significant size difference between the two, and his few specimens showed no actual overlap in length of wing or tail. Wetmore (1943:324) reported on two specimens (male and female) of *fuertesi* which fell within the size range of *spurius*.

The measurements of seven male and two female specimens are summarized in table 1. All but one female fall within the size limits of *spurius*. In order to analyze the

Table 1

Wing and Tail Length in *Icterus spurius* and *Icterus fuertesi*

	Wing				Tail			
Males	Observed limits	Mean	S.E. (mean)	S.D.	Observed limits	Mean	S.E. (mean)	S.D.
I. spurius (33) (North U.S.)	75–81.5	78.45	0.30	1.75	67–75	70.18	0.44	2.50
I. spurius (10) (S. Texas)	73–78	75.85	0.48	1.53	65–71.5	69.10	0.61	1.93
I. fuertesi (7) (Tamps. Mex.)	73–77	74.86	0.91	2.42	67–73	69.29	0.51	1.35
Females								
I. spurius (10) (North U.S.)	72–76.5	74.35	0.44	1.39	65–70	67.70	0.45	1.44
I. fuertesi (2) (Tamps. Mex.)	71, 73	.....	.....	.....	65, 66.5	.....	.....	.....

size relationship between the two species, we felt that we should know more about the size limits of *spurius*, and so borrowed a considerable series representing a variety of localities.

The race *I. s. affinis* named from southern Texas by Lawrence in 1852 was considered to be a population of smaller birds. The race has been accepted by some authorities, but not generally so. Amadon and Phillips (1947:579) suggested that *affinis* might be valid on the basis of both size and color characters.

Dickey and van Rossem (1938:533) pointed out that the use of specimens collected between April 1 and August 15 to represent "breeding birds" is misleading. Northward migration of *spurius* may last into May and the southward migration is in full swing probably early in July. Specimens of known breeding Orchard Orioles from any part of the species range are rare in collections; hence in order to obtain at least a small series of birds to represent the southern part of the range and still eliminate transients as much as possible, we used specimens collected in southern Texas between May 17 and June 25.

Dickey and van Rossem (*loc. cit.*) also stated that the difference between typical *spurius* and *affinis* was less a matter of linear measurements than of actual bulk; that is, that the latter had more slender bill, tarsus, and feet. In our small series, such differences are not apparent. Our series did show an actual difference in wing length, but not of tail in males of the two groups. Table 2 gives values for mean difference (d) in wing and tail length, and the statistic "t" as a measure of the significance of the difference in mean between *spurius* from the northern part of the species range (Michigan, Illinois, Iowa, Nebraska, Wisconsin, Pennsylvania, and Ontario), *spurius* from southern Texas, and

Table 2

Statistical Comparison between *I. spurius* of Northern United States[1] and Related Populations to the South

	Wing		Tail	
	d[2]	t[3]	d	t
I. spurius from southern Texas (10 spec.)	2.60	4.23	1.08	1.25
I. fuertesi from southern Tamaulipas (7 spec.)	3.60	5.95	0.89	0.88

[1] Basic data drawn from 33 specimens; see table 1.
[2] d = difference in mean length.
[3] t = statistic "t"; use 41 degrees of freedom for "t" of the two *spurius* populations, and 38 degrees for "t" of *spurius* and *fuertesi*.

fuertesi from southern Tamaulipas. A "t" of 4.23 for the difference in mean wing length between the two populations of *spurius* indicates that there is a probability of less than one per cent that the difference could be due to chance. Thus, there is a real difference in wing length between the two groups (see also table 1), but the amount of overlap is too great to warrant the recognition of *affinis* on this character. A "t" of 5.95 for the mean difference in wing length between northern *spurius* and that of *fuertesi* again indicates a real difference, though not necessarily a greater difference than between the two groups of *spurius*.

It is also interesting that no real difference in tail length is indicated either between the two *spurius* populations or between *spurius* and *fuertesi*. Thus, *fuertesi* could be fitted into the *spurius* size-cline fairly well.

Available weights do not indicate a notable difference in body bulk between the two species. Four adult male *fuertesi* weighed 19, 20, 20.5, and 22 grams, the sub-adult male 19, and two females 20 and 22 grams, respectively. None of these birds was fat, and the weights do not differ from comparable *spurius*.

Chapman (*op. cit.*) made no mention of color differences between females of the two species, but Wetmore (1943:323) stated that *fuertesi* differed "in faintly paler hue of the under-surface and the rump." We saw several Fuertes Orioles at their nests and feeding young out of the nest, but collected only two adult females. These show quite a variation in color. One (RRG 2272) was taken June 22, 1953, one-half mile west of Altamira. It was in the company of an adult male, and both were greatly alarmed by our presence, as we were probably near their nest. This female has the pale coloration of rump and underparts noted by Wetmore. Our other specimen (RRG 2245) was shot at its nest along with its mate (a fully adult male) on June 18, one mile east of Loma del Real. This specimen is no paler in any part than any of several female *spurius* at hand and differs only in its possession of a blackish patch on the throat and upper chest which suggests slightly the bib of the male. Although this pigmented condition could have been overlooked in the field, we did not see it in other females and do not believe that it is necessarily characteristic of female Fuertes Orioles. There is then a good chance

of overlap in both color and size characters in female *spurius* and *fuertesi* (see table 1). This raises the question whether females of the two forms are actually separable from one another morphologically.

Although there may be a tendency toward paler coloration and smaller size of female *fuertesi* than *spurius*, on the basis of our two specimens which were known mates of adult *fuertesi* males, we feel that it is highly unlikely that migrant female birds can be correctly differentiated. The same is very likely true of sub-adult males. A first-year male which we collected at its nest one mile east of Loma del Real on June 24 is also

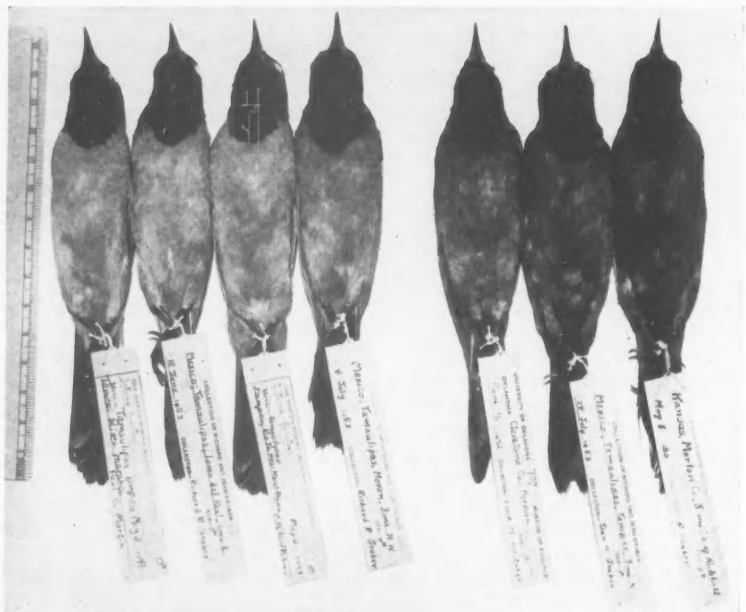

Fig. 2. Series of three Orchard and four Fuertes orioles showing tendency toward intergradation in color. Our northernmost specimen (R.R.G. no. 2316) of *Icterus fuertesi* is the bird in the center of the series.

richly colored and inseparable on this basis from comparable *spurius*. Our specimen measures: wing, 73 mm.; tail, 67; culmen from back edge of nostril, 13; and tarsus, 22. Again, in this plumage, color and size fall within the limits of *spurius*.

In view of the above similarities, then, it is extremely interesting that there is an apparent difference in color in the juvenal plumages of the two forms. Two stub-tailed, sibling female *fuertesi* which we collected just after they left the nest on June 18 weighed 13 grams each. One (RRG 2249) is slightly brighter colored, but both are notably paler than any of the eight (3 male and 5 female) juvenal *spurius* on hand. This series shows little, if any, sexual dimorphism, and is remarkably uniform throughout. The young of *fuertesi* differ from those of *spurius* as follows: the head and back are buffy gray, not olive or yellow green as in *spurius*; the rump is pale buff, not greenish. The tail is buff-gray, broadly light-tipped, not olive-green as in *spurius*; the wing bars are whiter and

notably narrower than in *spurius;* the throat, breast, belly, and undertail coverts are pale (buffy on breast) yellow throughout, in sharp contrast to the bright, rich yellow underparts of juvenal *spurius*. If our specimens are representative (bear in mind they come from one nest), the two forms may easily be differentiated in the juvenal plumage.

Beside that of juveniles, the other readily identifiable plumage is, of course, that of the adult male. This is probably the only plumage in which an intermediate between *fuertesi* and *spurius* would be very obvious. Apparently no such intermediate is known as yet. However, even within the small series of *fuertesi* at hand (5 specimens), there is considerable variation in intensity of coloration. Interestingly, our northernmost specimen (RRG 2316) is the darkest, and approaches slightly the palest *spurius,* though it is clearly a member of the *fuertesi* population (fig. 2).

A nest which we found on June 25 contained one undeveloped egg and a nestling in natal down probably less than a week old. Down of the crown and nape in this specimen is light gray, while that of the rest of the body is white; there is no down on the upper throat, breast, and hind-neck. Pale yellow feathers are just pushing through on the ventral pterylae of the nestling, while the dorsal tracts are quite dark with pin feathers. Primary quills are about one centimeter long and the secondaries slightly shorter. We find no description of the natal down in *spurius*.

Obviously the relationship between *Icterus fuertesi* and *spurius* is a close one. We cannot present any very strong argument against their being considered conspecific. The difference in juvenal plumage is interesting, yet probably no more striking than between the races of the Cowbird, *Molothrus ater ater* and *M. a. obscurus*.

On the other hand, several of the American orioles are quite similar, not alone in color and pattern, but also in their breeding habits. If ornithologists in general accept the view that the relationship is best expressed at the subspecific level, then it may be more consistent to treat others such as *Icterus galbula* and *bullockii* as conspecific. To introduce nomenclatural changes without sufficient knowledge of the forms involved is not good scientific practice, and in the present case our knowledge is exceedingly poor. *Icterus fuertesi* is a distinct form, and it does not seem inconsistent with the present classification of the genus *Icterus* to maintain it at the level of species until we have more facts.

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LITERATURE CITED

Amadon, D., and Phillips, A. R.
1947. Notes on Mexican birds. Auk, 64:576-581.

Beecher, W. J.
1950. Convergent evolution in the American orioles. Wilson Bull., 62:51-86.

Blake, E. R.
1953. Birds of Mexico. Univ. Chicago Press. 644 pp.

Chapman, F. M.
1911. Description of a new oriole (*Icterus fuertesi*) from Mexico. Auk, 28:1-4.

Dennis, J. V.
1948. Observations on the orchard oriole in lower Mississippi delta. Bird-Banding, 19:12-21.

Dickey, D. R., and van Rossem, A. J.
1938. The birds of El Salvador. Field Mus. Nat. Hist., Zool. Ser., 23:609 pp.

Forbush, E. H.
1927. Birds of Massachusetts and other New England states, vol. 2. Mass. Dept. Agr. 461 pp.
Goldman, E. A.
1951. Biological investigations in Mexico. Smith. Inst. Misc. Coll., 115:476 pp.
Lloyd, W.
1887. Birds of Tom Green and Concho counties, Texas. Auk, 4:289-299.
Merrill, J. C.
1877. Notes on *Molothrus aeneus*, Wagl. Bull. Nutt. Orn. Club, 2:85-87.
Pearson, T. G., Brimley, C. S., and Brimley, H. H.
1942. Birds of North Carolina. N. C. Dept. Agr. 416 pp.
Roberts, T. S.
1932. Birds of Minnesota. Univ. Minn. Press, vol. 2, 820 pp.
Sclater, W. L.
1939. A note on some American orioles of the family Icteridae. Ibis, 1939:140-145.
Thomas, R. H.
1946. An orchard oriole colony in Arkansas. Bird-Banding, 17:161-167.
Warner, D. W., and Mengel, R. M.
1951. Notes on birds of the Veracruz coastal plain. Wilson Bull., 63:288-295.
Wetmore, A.
1943. The birds of southern Veracruz, Mexico. Proc. U. S. Nat. Mus., 93:215-340.

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THE BIRDS OF GUADALUPE ISLAND IN 1953

By THOMAS R. HOWELL and TOM J. CADE

Guadalupe Island has been of great interest to biologists ever since the first members of its endemic fauna and flora were described over 75 years ago (Ridgway, 1876; Watson, 1875). The history of its avifauna, however, is a sad one of reduction and extermination through destruction of habitat by feral goats, predation by introduced house cats, and, regrettably, some excess of zeal by collectors. Today, even though only a remnant of its former biota remains, the island is still an attraction to anyone concerned with ecology and conservation.

We were given an opportunity to visit Guadalupe Island in June of 1953 with a party from the Scripps Institution of Oceanography, La Jolla, California. The Institution's vessel, the *E. W. Scripps*, left San Diego at noon on June 6 and arrived at the northeast anchorage of the island about 24 hours later. We stayed on the island from June 7 until the morning of June 12, when we boarded the *Scripps* for the return trip. Shelter while ashore was provided by abandoned adobe huts that once housed a detachment of Mexican soldiers. We were able to visit only the north and north-central parts of the island during our stay.

PHYSICAL FEATURES OF THE ISLAND

Guadalupe Island lies about 250 miles south-southwest of San Diego, California, and about 135 miles west of the coast of Baja California, México. It is about 22 miles long and from four to seven miles wide (see fig. 1). It is a true oceanic island, volcanic in origin, surrounded by depths of 12,000 feet, and reaches an elevation of about 4500 feet above sea level. The northern and north-central portions are highest, and it is there that almost all the remaining native trees are found. The northern portion of the island rises to a rather sharp ridge that drops off abruptly on the west side; the eastern slope is less steep. The ridge widens into a plateau in the north-central portion, and the elevation gradually declines from there to the southern end. Deep canyons leading to the sea are found on both east and west slopes. The surface of the island is covered with innumerable rock fragments of every shape and size, and walking is often difficult. Off the southern tip of the main island are two islets known as Inner and Outer Islet; they were not visited by us.

ECOLOGICAL CONDITIONS

Little remains of the once abundant vegetation that covered much of the island. Virtually all the native shrubs are gone, and those that remain are found only on vertical cliffs inaccessible to goats. However, several kinds of introduced annual grasses which can withstand heavy grazing are abundant over most of the island. On the northern ridge and its west slope there is a sparse grove of pines, *Pinus radiata*, and a few oaks, *Quercus tomentella*; most of these are magnificent old trees (fig. 2). Some fan palms, *Erythea edulis*, are found at lower elevations on the west slope. On the north-central plateau of the island is an extensive pure stand of cypress, *Cupressus guadalupensis* (fig. 3). No seedlings of any of the three species of trees are to be found as those that come up are eaten by goats. At present the cypresses are far more abundant than all of the other trees combined. The cypresses too are all old trees, and they have attained a variety of growth forms—low and gnarled, tall and straight, broad and spreading—so that from a distance the grove appears to be a mixed rather than a pure stand. On a plateau below and to the east of the main one, another grove of cypresses formerly ex-

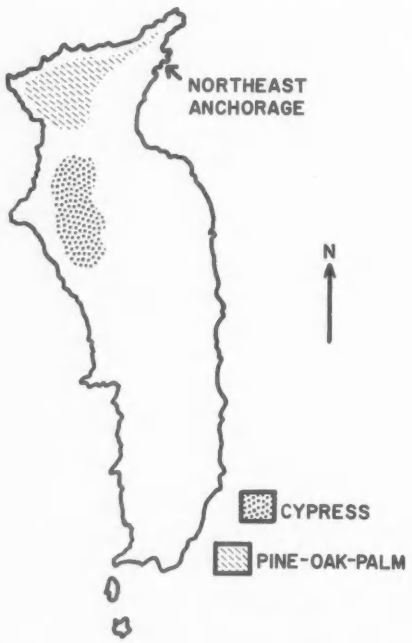

Fig. 1. Outline map of Guadalupe Island, showing forested areas.

isted by a spring (fig. 4); it was there that W. E. Bryant camped and collected in 1886 (Bryant, 1887). No trace of this grove remains today.

At the northeast anchorage the large shrub *Nicotiana glauca* has been introduced since 1932 and has multiplied and spread rapidly in this area (fig. 5). This plant is not eaten by goats, and clumps of *Nicotiana* now provide food and cover for several species of small birds.

There are no native terrestrial mammals on the island. No reptiles or amphibians have ever been recorded from it, and we did not find any despite diligent searching.

As at the time of Bryant's visit in 1886, the abundant blow flies are a constant nuisance to all the larger mammals on the island—goats, elephant seals, and men—during the daylight hours. The only other conspicuous flying insects noticed by us were small moths which were seen in the cypress grove and among the *Nicotiana* plants. These moths were not very numerous even about our lantern at night. High winds and scarcity of leafy vegetation on which larvae could feed may account for this. We did not see any insects that would have larvae large enough to be a major source of food for the caracara, *Caracara lutosus,* although caterpillars were once important in the diet of that extinct species (Bryant, 1887).

Under flat stones and pieces of wood we found numerous small spiders, pill bugs, centipedes, millipedes, beetles, roaches, crickets, and termites, the latter only under wood. We were surprised to find hymenopterans extremely scarce. One wasp was seen

on open ground, and one large black ant of the *Camponotus* type was seen in the cypress grove.

We did not see any land snails or any trace of them although they were once abundant on the island.

Fig. 2. An old pine (*Pinus radiata*) on northern ridge; note man at lower right.

At present only two springs on the island are known to be still flowing. These are the one mentioned above, where a small cypress grove formerly grew, and a smaller one about one-quarter mile to the east. Rain pools are a transient source of fresh water, especially in the winter months. On the northern portion of the island, wind-driven fog condenses as it strikes the trees and water pours down from them as though a heavy rain were falling. As winds and fog occur at almost all times of year, the pools which form under the trees are undoubtedly an important source of drinking water for birds.

OBSERVATIONS OF BIRDS

The trees at the top of the island can be reached from the northeast anchorage only after two or three hours of strenuous climbing, and conditions may be alternately hot and parched or cold, wet, and wind-swept. We spent one day in the pine-oak area, one in the cypress grove, and the rest of the time around the northeast anchorage, particu-

larly along the shore and among the *Nicotiana* plants. An annotated list of the birds we observed is given below. Species not seen by us but obtained by personnel of the *E. W. Scripps* are also included.

From January 27 to February 1, 1950, John R. Hendrickson visited the island as a member of a group on J. W. Sefton's research ship *Orca*. Hendrickson collected specimens at several points on the periphery of the island and at Outer Islet; most of these

Fig. 3. Part of grove of cypresses (*Cupressus guadalupensis*) on north-central plateau.

specimens and all of Hendrickson's notes are at the Museum of Vertebrate Zoology, University of California, Berkeley. Some specimens went to the San Diego Natural History Museum, San Diego, California, and the most unusual ones have been reported by Huey (1952). As no other of Hendrickson's records from the island have been published, those of particular interest have been included here.

Puffinus puffinus opisthomelas. Black-vented Shearwater. A female of this species struck a light on the *Scripps* on the night of June 11 at the south end of the island. Some of the secondaries are worn but otherwise the plumage appears fresh. The ovary was not enlarged.

Oceanodroma leucorhoa socorroensis. Leach Petrel. Seven of these petrels, four males and three females, struck the lighted ship during the nights of June 7 to 12. As is usual with petrels the secondaries of all these birds are worn, and the rectrices of two show conspicuous wear. Testis measurements varied from 2 × 1 mm. to 3 × 2.5 mm., and the ovaries of two of the females had follicles as large as 2 mm. in diameter.

On January 27, 1950, Hendrickson found two petrel nests, presumably of this species, on Outer Islet. Each nest was at the end of a burrow under a large rock, and each contained a single downy young. No adults were found in these nests. On January 31, Hendrickson visited a small, unnamed rock islet between Inner Islet and the southern tip of the main island. Here he found at least seven nests, some with eggs, but most containing large downy young that "looked larger than the parent." Adults were usually present, incubating or brooding. The nests were located six to 36 inches back in crevices and gas pockets in the volcanic rock. In one of these crevices the specimen of *Oceanodroma tethys tethys* reported by Huey (1952) was collected.

Austin (1952) is the most recent reviser of the systematics of this difficult species group. He states (p. 401) that *socorroensis* almost always has some white in the rump, but never as much as typical *beali*. Two of our Guadalupe Island birds have as much if not more white in the rump than any

examples of *beali* in a series of 24 in the Dickey Collection taken on the Pacific Coast from southern Alaska to California. One of our seven birds does not have a single white feather in the rump, and another has only grayish-white edgings to a few of the rump feathers. Our other birds and six adults taken by Hendrickson show an intermediate condition. Our specimens suggest that this population is even more variable than Austin's series of 23 birds would indicate.

Falco sparverius sparverius. Sparrow Hawk. These falcons were seen daily during our stay. A pair had evidently nested on a cliff overlooking the sea at the northeast anchorage, for we saw a pair of

Fig. 4. Northeast slope of island seen from north-central plateau; a cypress grove formerly existed at left-center of this area. This barren terrain is typical of most of the island.

adults with three juveniles—two males and a female—at this spot. The young were fully able to fly, but we saw the adult male feed one of them. Another pair was seen in copulation on a cliff in the north-central section, and two other single individuals were seen in the forested areas.

The Guadalupe Island population has been described as an endemic race, *guadalupensis*, by Bond (1943). We were unable to obtain specimens, and thus we are not prepared to comment on the validity of this form.

Heteroscelus incanus. Wandering Tattler. One was collected on June 12 at the edge of a cobble beach at the northeast anchorage; its plumage is moderately worn. Single individuals were seen at this same locality on June 7 and June 11, and a second bird was seen on June 12. Hendrickson noted three of these birds at the south end of the island on January 31, 1950.

Arenaria melanocephala. Black Turnstone. Hendrickson collected two of these birds at the south end of the island on January 31, 1950. This species has been recorded only once before from Guadalupe Island, and these are the first specimens from this locality.

Capella gallinago delicata. Wilson Snipe. A single snipe was seen at close range on June 8 as it flew by at the top of the northern ridge. This species has not previously been reported from Guadalupe Island.

Larus argentatus. Herring Gull. Hendrickson mentions in his notes for January 27, 1950, that this species was repeatedly seen by all members of the *Orca* party. Carl L. Hubbs, who was one of this group, informs us (personal communication) that he agrees with Hendrickson's identification. This is the first report of this species from Guadalupe Island; no specimens were collected.

Larus occidentalis wymani. Western Gull. This gull is not abundant on or around Guadalupe Island. We saw no more than three at the northeast anchorage, and the *Scripps* personnel said that even when garbage was thrown overboard, no more than 10 of these gulls were seen at the south end

of the island. Only adults were seen by us, and one male was collected on June 9. The testes measured 10 × 7 mm.

Carl L. Hubbs and George A. Bartholomew asked us to take particular notice of the color of the legs and feet of Guadalupe Island examples of *Larus occidentalis,* stating that these parts were white or almost white in contrast to the pink or flesh color found in populations on the nearest islands or the mainland. The legs and feet of our specimen were definitely whitish with only a faint pinkish cast. This color, possibly caused by blood in the capillaries, faded out within an hour and left the legs and feet ivory white. On comparing this specimen five months later with examples of *L. o. occidentalis, L. o. wymani,* and *L. o. livens* from California and Mexico, we find that the legs and feet appear paler and more translucent in our specimen than in any of the others; in other respects it seems identical with examples of *wymani.* However, the legs and feet of two adults taken by Hubbs and Bartholomew on February 1 and 2, 1950, although white in life, are now deep yellow-brown and identical in color with mainland specimens of *wymani.* The Guadalupe Island birds do not differ from *wymani* in size.

It is possible that the Guadalupe Island population represents an undescribed endemic race which differs on the basis of leg and foot color, but present information is not sufficient to justify a formal description.

Endomychura hypoleuca hypoleuca. Xantus Murrelet. A male flew aboard the *Scripps* on the night of June 8 and was collected. The primaries, primary coverts, and distal secondaries are worn, but otherwise the plumage appears fresh. The testes measured 5 × 3 mm.

Zenaida asiatica mearnsi. White-winged Dove. An adult female collected on June 10 in the *Nicotiana* grove at the northeast anchorage represents the first record of this species from the island. The bird was not fat but appeared in good condition, and the plumage is not worn. The largest follicles were 2 mm. in diameter. The subspecific identification has been checked by Alden H. Miller.

Speotyto cunicularia hypugaea. Burrowing Owl. Two of these owls, presumably a pair, were seen on June 11 on a barren plateau below and to the east of the cypress grove. Hendrickson saw three Burrowing Owls in a canyon on the southwest side of the island on January 31, 1950.

Calypte anna. Anna Hummingbird. This species, previously very rare on the island, appears to have become established in the *Nicotiana* grove at the northeast anchorage where it was seen daily during our stay. We estimated the size of the population as 15 to 20 individuals. Of five specimens collected, two were young of the year with clear, soft skulls. It is probable that these and several other immatures seen were hatched from island nests. Both adults and immatures were in various stages of plumage ranging from fresh immature plumage with a few metallic gorget feathers through extensive molt and replacement of all feathers to almost complete post-breeding adult plumage. The testes of three adult males were very slightly enlarged, measuring 2 × 1 mm., 2.5 × 2 mm., and 3 × 2 mm.; no adult females were obtained.

We noted that the calls of both adults and immatures sounded different from those of mainland individuals. The characteristic buzzing song or call of the latter was never heard; the island birds produced more of a rapid chirping or twittering. Comparison of our five island specimens with a series from California revealed no detectable differences in color or size. It is possible that the small insular population does have an established vocal difference, but future observation will be needed to substantiate this. As the *Nicotiana* provides food, perches, and nesting sites, it is likely that the Anna Hummingbird population will increase as the shrub spreads more widely over the island.

Sitta canadensis. Red-breasted Nuthatch. An isolated population of nuthatches still breeds on Guadalupe Island, for a bird of the year with a clear, single-layered skull was collected in the cypress grove on June 11. One other was seen and a third was heard calling on the same day in different parts of the grove. The single specimen, a female, is indistinguishable from birds of similar age from northern United States. New rufous feathers with the sheaths still intact at the base are appearing on the throat and breast of this individual; no other feather replacement is evident.

Salpinctes obsoletus guadeloupensis. Rock Wren. The Rock Wren is presently the most abundant bird on the island, being found in all situations from the cobble beaches to the forests. Across even the most barren-looking open stretches we encountered a Rock Wren about every 300 yards, and they were much more numerous than that among the trees, in canyons, and in other favorable situations such as at the northeast anchorage. Young were numerous, sometimes still being fed by adults. We estimated that at least one out of every three birds seen was immature. Although these wren were not

wary, they never alighted on us or on objects held in the hand as has been reported by previous observers. Two adults, one male and one female, were collected; the male had partly enlarged testes, 5 × 2.5 mm. Both specimens are in very worn plumage with molt just beginning; some adults were seen in more advanced molt. One immature male was also collected.

From January 27 to February 1, 1950, Hendrickson collected six specimens at the southwest side of the island. Two females had already layed, and another had an ovum 10 mm. in diameter. The testes of one male measured 7 mm. in diameter. Data on the reproductive condition of the other two birds is inconclusive or lacking.

Fig. 5. Looking west from northeast anchorage, showing clumps of *Nicotiana glauca* and part of abandoned barracks.

Regulus calendula obscurus. Ruby-crowned Kinglet. This endemic race is still extant, at least in the cypress grove, where we observed about five singing males on June 11. As we could not visit all parts of the cypress grove, and as only singing males were likely to be detected, no accurate estimate of the population size could be made. One male, with enlarged testes measuring 6 × 4 mm., was collected. Its plumage is only slightly worn, and it is not in molt.

Seiurus aurocapillus aurocapillus. Oven-bird. The presence of this species on the island at any time would be remarkable, and finding a bird typical of the northeastern subspecies on June 9 was totally unexpected. The specimen, collected at the northeast anchorage, proved to be a male in good condition, plumage unworn, with enlarged testes measuring 9.5 × 6 mm. The subspecific identification was checked by Alden H. Miller. This represents the first record of this species from Guadalupe Island.

Carpodacus mexicanus amplus. House Finch. This species is second only to the Rock Wren in abundance and is found commonly wherever there is vegetation other than pure grass; even in grassy and rocky areas these finches are not rare. This is the most abundant species in the *Nicotiana* grove at the northeast anchorage and in the cypress grove, especially the latter. We estimated that about 40 per cent of the birds we saw were immature; a few of these, although large, still had traces of down on their heads and were occasionally fed by adults. Two adult males and one adult female were collected; the gonads were not enlarged. Six males collected by Hendrickson on January 27 and 29, 1950, had testes 5 to 6 mm. in diameter; a female taken on January 29 had already layed.

The only readily apparent difference between this insular form and the House Finches of the mainland is the larger bill and slightly larger general size of the island birds. In all other aspects of appearance and in voice and behavior, the island form seems identical with the species *mexicanus*. We feel, therefore, that *amplus* should be accorded only subspecific status.

Junco insularis. Guadalupe Junco. The junco is nearly as abundant as the House Finch and is found in the same situations, although usually near the ground. They were more abundant in the pines and oaks than any other species on the day we visited that area. We noted that the juncos fed extensively on insects as well as seeds, often using their relatively long bills to probe into crevices in fallen logs. Many streaked immatures were seen, particularly in the cypress grove, where we estimated their numbers as 40 to 50 per cent of total. In the *Nicotiana* grove, however, only about one in ten birds was a streaked immature. We did not see any birds in plumage intermediate between that of streaked immatures and adults, but adults were seen in all stages of molt. Three adults, two males and a female, were collected. The testes of one male not yet in molt were enlarged and measured 6 × 6 mm.; the other two birds, in molt, did not have enlarged gonads. One streaked immature was also collected. Juncos sang frequently, and the song, as rendered in our notes, was usually *wheep'-whit-whit-whit-wheep.*' We did not hear the slow trilling song characteristic of populations of *Junco oreganus* on the mainland.

The Guadalupe Junco, in contrast to the House Finch, differs from related mainland populations in several points of voice, morphology, and coloration. These differences include some (color pattern, song) which, in general, operate to prevent interbreeding between populations. In our opinion, *insularis* is sufficiently distinct to merit specific status.

DISCUSSION AND CONCLUSIONS

Each visitor to Guadalupe Island since the first has commented on the progressive decline of the flora and fauna, and we are obliged, regrettably, to continue this tradition. We found no trace, of course, of any of the endemics considered extinct. Indeed, the complete absence today of shrubs or understory of any kind in the forests of the island makes it difficult to realize that the towhee, *Pipilo erythrophthalmus consobrinus*, and the wren, *Thryomanes bewickii brevicauda*, once existed there, and this utter lack of suitable habitat should convince even the most hopeful skeptic that these forms are totally extinct. Two nonendemic birds which were once reported to be resident on the island were not found by us; these are *Buteo jamaicenses calurus and Loxia curvirostra bendirei*. The former was almost always seen by previous visitors, and it is unlikely that we could have missed seeing such a conspicuous soaring hawk if any were present on the northern half of the island where they have always been reported before. The crossbill could have been overlooked by us, but there have been no published records of its occurrence since 1903 (Kaeding, 1905). It is thus doubtful that either of these species resides now on the island.

The crossbills collected on the island by Bryant in 1886 were destroyed in the San Francisco earthquake and fire of 1906. Six specimens collected by A. W. Anthony on September 20, 1896, are in the Carnegie Museum, and we know of no others from Guadalupe Island that are still extant. We have recently examined and measured this series, which consists of two immature males, two immature females, and two subadult females, and find that these six resemble *bendirei* in all respects. This is in accord with the decision of Griscom (1937) as stated on page 173 of his monograph on the crossbills. On page 133 of the same work, however, Griscom assigned the Guadalupe Island birds to *grinnelli*, and Blake (1953) followed this determination in his recent field guide. Griscom has kindly informed us (*in litt.*) that he believes that the statement on page 133 of his monograph must have been an editorial mistake. Thus, unless specimens not known to us indicate otherwise, the crossbills of Guadalupe Island should be referred to the race *bendirei*. There are no breeding records for this species from the island, and it may never have been a true resident.

Introduced mammals which have greatly damaged the fauna and flora are house mice, house cats, and goats. The mice, of which we saw a few, are probably not important in relation to the birds except as possible food for the Sparrow Hawks and Burrow-

ing Owls. We saw no cats, but at the northeast anchorage we found a few cat droppings that contained feathers of passerine birds and bones and hair of mice. Earlier accounts mention that the top of the island was often littered with the remains of petrels eaten by cats. We did not find any remains of cat-eaten birds, but we cannot say whether this was because of an absence of cats or lack of petrels.

The goats continue to be the greatest threat to the biota of the island through their destruction of vegetation. They number in the thousands and are found in even the most rugged and—for human beings—inaccessible parts of the island. We do not think it possible to reduce their numbers seriously for long duration by methods such as shooting or poisoning, for the goats are too numerous in areas difficult or almost impossible to reach.

The introduction of large predators might reduce but not remove the goat population but would probably create serious problems for the few human inhabitants. Introduction of a disease would also be dangerous and might be effective only in bringing about a short term reduction in numbers of goats. Fencing off portions of the forest so that seedlings could develop would improve the present situation, but maintenance problems would be severe and many years of protected growth would be necessary before the young trees would be safe from goats. In any case, final responsibility for any such conservation program rests with the Mexican government, since the island is Mexican territory.

The presence of *Nicotiana glauca* on the island is cause for some hope, for as this "goat-proof" plant achieves a wider distribution it will provide an extensive habitat for small birds. Quite possibly some additional species, especially passerines, will become resident in the future.

As for the present resident land birds, at least three—the Rock Wren, House Finch, and Guadalupe Junco—appear to be thriving and in no danger of extinction. The Sparrow Hawk and probably the Burrowing Owl seem about as well established as they would be on a mainland area of similar size. The Anna Hummingbird will probably increase as the flowering *Nicotiana* increases. The status of the kinglet and the nuthatch is less certain, for they are dependent on the presence of the large trees. The cypress grove at least will remain extensive for many years to come, and we feel that the kinglet and nuthatch will also persist for many years unless an unforeseen catastrophe occurs.

CHECK-LIST OF GUADALUPE ISLAND BIRDS

The following check-list is presented for the use of future investigators who wish to have a brief summary of all the birds recorded from Guadalupe Island. Off-shore records of birds collected or seen "near" the island are omitted; only records from along the shore or on the island itself are included. Records unsupported by a specimen are marked with an asterisk. A single occurrence of a species is considered accidental; species for which there is more than one record but not enough to be considered regular are listed as casual. Some of these may have been of regular occurrence before most of the island vegetation was destroyed. Most of the casual and accidental records are those of Bryant (1887). In some cases taxonomic revisions since that date make the subspecific status of his specimens uncertain, but all of Bryant's Guadalupe Island collection except the type and co-type of *Oceanodroma macrodactyla* was destroyed in 1906 and reexamination is thus impossible. No subspecific name is given in these indeterminate cases.

All pertinent references up to 1927 regarding the birds of the island are given by Grinnell (1928). Publications since 1927 containing new information about the island avifauna that are not mentioned in this paper are listed after the "Literature Cited" section of the present work.

Gavia arctica pacifica.—Accidental.
Puffinus puffinus opisthomelas.—Breeding.
Oceanodroma leucorhoa socorroensis.—Breeding.
[*Oceanodroma homochroa.*—Gaylord (1897) reported finding a wing of this species on the island; he did not save the "specimen." As it is extremely doubtful that specific identity could be determined from a wing alone, this species should be dropped from the list of Guadalupe Island birds.]
Oceanodroma macrodactyla.—Formerly breeding; unreported since 1919, and probably extinct.
Oceanodroma tethys tethys.—Accidental.
Phalacrocorax auritus albociliatus.—Casual.
Phalacrocorax penicillatus.—About five pairs, presumably breeding, on Outer Islet in 1925; not recorded before or since.
**Pelecanus occidentalis californicus.*—Accidental.
**Ardea herodias.*—Casual.
**Anser albifrons.*—Accidental.
Buteo jamaicensis calurus.—Apparently resident at least until 1932; no definite breeding records.
Caracara lutosus.—Formerly breeding, now extinct; last reported seen in 1903.
Falco sparverius sparverius.—Breeding.
**Falco mexicanus.*—Accidental.
Pandion haliaetus carolinensis.—Accidental.
Heteroscelus incanus.—Regular visitor.
Arenaria melanocephala.—Casual.
**Capella gallinago delicata.*—Accidental.
**Larus argentatus.*—Accidental.
Larus occidentalis wymani.—Breeding.
**Larus glaucescens.*—Accidental.
Endomychura hypoleuca hypoleuca.—Breeding.
Ptychoramphus aleuticus.—Regular visitor.
Cerorhinca monocerata.—Accidental.
**Zenaidura macroura.*—Accidental.
Zenaida asiatica mearnsi.—Accidental.
Speotyto cunicularia hypugaea.—Breeding.
Aëronautes saxatalis.—Regular visitor, at least formerly. Reported nesting in 1892; unreported since 1922.
Calypte anna.—Apparently breeding, 1953.
Colaptes cafer rufipileus.—Formerly breeding, now extinct; unreported since 1906.
Sitta canadensis.—Breeding.
Salpinctes obsoletus guadeloupensis.—Breeding.
Thryomanes bewickii brevicauda.—Formerly breeding, now extinct; last reported seen, 1903.
Mimus polyglottos leucopterus.—Accidental.
Oreoscoptes montanus.—Accidental.
Turdus migratorius propinquus.—Casual.
Ixoreus naevius.—Accidental.
Hylocichla guttata.—Casual.
Sialia currucoides.—Casual.
**Myadestes townsendi.*—Accidental.
Regulus calendula obscurus.—Breeding.
Anthus spinoletta.—Accidental.
Bombycilla cedrorum.—Accidental.
Lanius ludovicianus.—Accidental.
Dendroica auduboni auduboni.—Casual.
Seiurus aurocapillus aurocapillus.—Accidental.
Geothlypis trichas occidentalis.—Accidental.
**Sturnella neglecta.*—Accidental.
Piranga rubra rubra.—Accidental.
Carpodacus mexicanus amplus.—Breeding.

Loxia curvirostra bendirei.—Formerly "resident"; no definite breeding record; unreported since 1903.
Pipilo erythrophthalmus consobrinus.—Formerly breeding, now extinct; unreported since 1897.
Junco oreganus.—Accidental.
Junco insularis.—Breeding.
Spizella passerina arizonae.—Accidental.
Zonotrichia atricapilla.—Casual.
Zonotrichia albicollis.—Accidental.
Passerella iliaca.—Accidental.
Melospiza lincolnii lincolnii.—Casual.

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LITERATURE CITED

Austin, O. L., Jr.
1952. Notes on some petrels of the north Pacific. Bull. Mus. Comp. Zool., 107:391-407.
Blake, E. R.
1953. Birds of Mexico (Chicago, Ill., Univ. Chicago Press).
Bond, R. M.
1943. Variation in western sparrow hawks. Condor, 45:168-185.
Bryant, W. E.
1887. Additions to the ornithology of Guadalupe Island. Bull. Calif. Acad. Sci., 2:269-318.
Gaylord, H. A.
1897. Notes from Guadalupe Island. Nidologist, 4:41-43.
Grinnell, J.
1928. A distributional summation of the ornithology of Lower California. Univ. Calif. Publ. Zool., 32:1-300.
Griscom, L.
1937. A monographic study of the red crossbill. Proc. Boston Soc. Nat. Hist., 41:77-210.
Huey, L. M.
1952. *Oceanodroma tethys tethys*, a petrel new to the North American avifauna. Auk, 69:460-461.
Kaeding, H. B.
1905. Birds from the west coast of Lower California and adjacent islands. Condor, 7:105-111; 134-138.
Ridgway, R.
1876. Ornithology of Guadalupe Island. U. S. Geol. and Geog. Surv. Terr., 2:183-195.
Watson, S.
1875. On the flora of Guadalupe Island, Lower California. Proc. Amer. Acad. Arts and Sci., 11:105-119.

PERTINENT REFERENCES ON GUADALUPE ISLAND BIRDS PUBLISHED SINCE 1927

Abbott, C. G.
1933. Closing history of the Guadalupe caracara. Condor, 35:10-14.
Green, J. E., and Arnold, L. W.
1939. An unrecognized race of murrelet on the Pacific coast of North America. Condor, 41:25-29.

Huey, L. M.
1954. Notes from southern California and Baja California, Mexico. Condor, 56:51-52.
Miller, A. H.
1941. Speciation in the avian genus *Junco*. Univ. Calif. Publ. Zool., 44:173-434.
Swarth, H. S.
1933. Off-shore migrants over the Pacific. Condor, 35:39-41.
Van Rossem, A. J.
1942. Preliminary comment on some Pacific coast petrels. Proc. Biol. Soc. Wash., 55:9-12.
Wetmore, A.
1933. A skeleton of the Guadeloupe (*sic*) caracara. Condor, 35:206.

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NESTING OF THE GREENLAND WHEATEAR ON BAFFIN ISLAND

By GEORGE M. SUTTON and DAVID F. PARMELEE

In the vicinity of the United States Air Force Base near the head of Frobisher Bay, in southern Baffin Island, the Greenland Wheatear (*Oenanthe oenanthe leucorhoa*) bred in considerable numbers in the summer of 1953. During our sojourn there from June 14 to August 22, we saw it almost daily. It was not, however, as common as the Snow Bunting (*Plectrophenax nivalis*), Lapland Longspur (*Calcarius lapponicus*), Water-Pipit (*Anthus spinoletta*) or Horned Lark (*Eremophila alpestris*).

We lived at the east edge of the Base. By walking westward a mile—as far as the Sylvia Grinnell River—northward two to three miles, and eastward or northeastward three to five miles, we covered fairly regularly and often an area about 18 square miles in extent, much of which was "desert tundra," a habitat preferred by the wheatear (Soper, 1940:16-17). In the area eight or more pairs of the birds nested, five within about a mile of the Base. We found four nests, none less than half a mile apart. Nest 1 was near the Hudson's Bay Company post, about a mile east of the Base, on a clifflike slope along the bay shore proper. Nest 2 was in the southwest face of a sprawling mass of rock a third of a mile northeast of the Base. Nest 3 was under a rock on a bluff hill about a mile northwest of the Base. Nest 4 was under a rock on a low ridge about a quarter of a mile north of the building in which we lived. A fifth pair of wheatears lived along the rocky east bank of the Sylvia Grinnell River, but its nest was not located.

None of the four nests had been used previously, and we observed nothing indicating that a second brood had been, or was being, reared anywhere in the region. The nests were thin-walled, shallow, not very compact, and definitely one-layered. We were eager to obtain data on re-use of nests and on second broods because of the remarkable findings of Wynne-Edwards (1952:378) on these matters at Clyde, Baffin Island, in 1950.

In addition to the ten adult wheatears and the young from four nests, we many times saw and heard an adult male which seemed unmated the whole summer, and at the Hudson's Bay Company post, in early August, we saw an adult female and at least four young which had not been reared in the nest we found in that vicinity. Also, in rough country east of the Hudson's Bay Company post, we saw adults with or without young on several occasions. Part of this last-named area was outside the 18-square-mile area we regularly visited. However, we found the species only near the coast in the general vicinity of the Base.

The unmated male wheatear mentioned above was unapproachable, far-ranging, and given to singing a great deal. We several times encountered it in high land about half a mile northeast of the Base. It commonly sang briefly from a bald knob above us, and then suddenly launched forth in flight-song. Occasionally it hovered on rapidly beating wings while singing, but usually moved forward, high in air, to another knob two or three hundred yards away, singing the whole time. If we followed, it gave snatches of song as it moved from rock to rock ahead of us; or, finding itself on an eminence, it launched forth again in flight-song, making its way to a knob farther on, or, in a wide circle, back to the place from which it had first flown. It may have had a mate and nest; but it certainly acted as if it were in no way attached. Whether it was the "extra" male which appeared at nest 2 on June 28 and helped with feeding the large brood there, we did not know. Nest 2 was fully a mile from the high land which this male frequented.

BREEDING BEHAVIOR

Several authors (including Kumlien, 1879:73; Soper, 1928:116, 1940:16-17, and 1946:420; Sutton, 1930 and 1947; Taverner, 1934:128; Forbes, 1938; Shortt and

Peters, 1942:347 and Wynne-Edwards, 1952:377-378) have already reported the Greenland Wheatear from eastern and southern Baffin Island. We saw it first on June 15, on a rocky ridge northeast of the Base. The south-southeast wind was not especially strong, but the air was chilly (maximum temperature: 39.1°F.) and snow half-covered all the higher slopes. More snow fell that day, too—odd, hard, opaque little balls resembling hail. While we were watching a pair of Snow Buntings, a bird of similar size appeared on a large boulder, lifted one half-spread wing in the wind, and flew off revealing a bold white rump-patch. The wheatear probably was a female, for its prevailing color-tone was brown. Later in the day a handsome male approached us closely, alighting on a great rock with tail fanned wide. It sang several times. The songs were bright and interesting, but short and not wholly musical, for some phrases were harsh. It did not scold us at all, nor did it sing a flight-song.

Two days later (June 17) we saw three wheatears just northeast of the Base. One was called by us a "full adult in high plumage." It may well have been the "unapproachable" male already mentioned. There was also another male—this a duller, perhaps younger, individual. It hopped and flitted along, revealing its white rump-patch, occasionally singing a brief song. A still duller, browner bird was near it, a female. We were much impressed with the female, which had a way of hopping along quietly, stopping now and then with head cocked to one side as if looking or listening intently. Her eyes were large. She reminded us of a Robin (*Turdus migratorius*). While standing still, in "listening" attitude, her tail hung almost straight down, with its tip against the rock or moss. The male, by contrast, was the very embodiment of excitability and agitation. As he flitted along the slope he seemed almost to hurl himself at, or pounce upon, the rocks he used as perches. His tail was never at rest. For a time the female was preoccupied with a spot at the edge of a large snowbank. She seemed to be finding food on the moist ground there. The two were rarely more than 30 yards apart; but they did not keep close together. The male never fed the female nor, so far as we could tell, displayed before it; and neither bird made a move that in any way suggested nest-building. The male performed no flight-song.

It seems clear now that these birds had a nest downslope from us about a hundred yards, and that the female was not on the nest because, not having laid the full clutch of eggs, it had not yet started incubating them. One thing is certain: that very day there was a wheatear nest not far from us, near what we called Snow Bunting nest "No. 1." The bunting nest we visited regularly from June 15 to mid-July. In going to it we usually walked up a ravine from the tundra-flat to the south and in so doing continued to miss the wheatears' nest-territory just to the west. We found the wheatear nest July 8, on which date it held young about a week old (see below). Allowing two weeks for incubation and several days for growth of the nestlings, we submit that it must have held an incomplete clutch on June 17.

On June 22 we found wheatear nest 1. It was on a steep rocky slope, almost a cliff, about 60 yards above high-tide mark. It was in a fissure in a vertical southward-facing wall of rock and contained four well developed young. We found it by watching the parent birds, which were much agitated by our presence. They called *weet*; *chack* (or *check*); occasionally *weet-check*; infrequently a rapid *check-check-check-check-weet* or *eet-check-check-eet*. We thought we could identify spiders, large crane-flies, and caterpillars among the food they brought in. The male and female seemed to be about equally active in bringing food and in scolding us. The male sang infrequently but did not perform a flight-song. The nesting spot was sheltered, sunny, indeed downright warm in comparison with the windy slopes above. The young wheatears made no attempt to scramble from the nest when we touched them, nor did they squeal on being brought

out for examination. The long, shaggy natal down, which clung in profusion to the plumage of their upper parts, was mouse gray. Their mouth-corners were pale yellow, the lining of their mouths dull orange-yellow, without spots or blotches of any sort.

On June 23 we saw a female wheatear near the bunting nest referred to above. Sutton's notes for that day read: "When I went to Snow Bunting Nest No. 1 early this

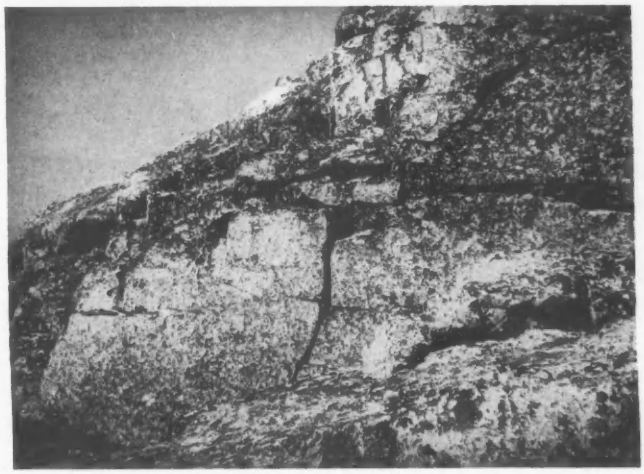

Fig. 1. Site of nest 1 of Greenland Wheatear; Frobisher Bay, Baffin Island, June 22, 1953.

morning, I saw no bunting in the immediate vicinity, but a female wheatear did fly from the little ridge and I thought at first it had flown directly from the nest. It fluttered rapidly from rock to rock and disappeared before I realized what was happening. Wonder where these birds can be nesting!" We now believe that this female wheatear *did* leave her nest that morning. On June 24, while Parmelee was making observations near Snow Bunting nest no. 1, he saw the male bunting fiercely driving a male wheatear off. This was additional evidence that the bunting and wheatear nests were not far apart.

On June 25 we found wheatear nest 2, this one with seven well developed young. We found it by watching the female carrying food. The nest was in a narrow niche in a vertical, southwestward-facing wall of rock. The nest-niche was about 10 feet above ground. We could not feel into the nest for the crevice was narrow (cf. Forbes, 1938:493). Both the male and female were busy feeding the young. The male was not singing. The young were hard to count for the nest was about two feet back in the niche. Sunlight probably never touched them directly, but they certainly were well sheltered from the wind and rain. Several big snowbanks in the vicinity were melting rapidly. There was a meltwater pool some inches deep at the foot of the nest-wall.

On June 25 we visited nest 1, finding the young there almost ready to leave. They scrambled into the crack back of the nest when touched. Two which we caught by the tarsi and toes we pulled gently out for examination. They did not squeal on being handled. Much natal down still clung to the plumage of their upper parts. The larger nestling, a male, we took as a specimen. The nest and young were crawling with mites.

On June 28 we spent a total of almost 14 continuous hours observing the feeding of the seven young at nest 2 (see table 1). We went to the nest about 8 a.m., but did not begin recording our observations until 9:45. By 9:45 we had two or three times seen an *extra* male bird which evinced great interest in the nest. This bird was, we believed, fully adult although it was somewhat less boldly colored than the bird we felt sure to be the male parent. It sang a full loud song occasionally, whereas the only songs given by the male parent were short and not very loud. Only once, at 9:49 a.m., did we see the two males and the female all at the same time. At 1:20 p.m., Sutton saw the male parent drive off the dull-colored "extra" male, but the chase was not spirited. At 1:42 p.m.,

Fig. 2. Site of nest 2 of Greenland Wheatear; Frobisher Bay, Baffin Island, June 25, 1953. The nest was about 10 feet above ground in the shadowed forepart of the great mass of rock.

one male flew in with food just as the other male left the nest—good evidence that two males were actually feeding the young. What the "extra" male was, or where he had come from, we did not know.

The weather conditions of June 28 merit detailed discussion. The day was sunny but chilly. The south-southeast wind became steadily stronger, working up to a velocity of 20 mph. The minimum temperature was 33.2°F., the maximum 44.2°. Fog, drizzle, or rain often accompanied a south or southeast wind at this season (the whole bay was ice-covered), so despite the sky's brightness, we were half expecting the weather to worsen. At 7:40 p.m. Sutton jotted down a note to the effect that the sun had been "under a cloud for about ten minutes." This marked the beginning of almost five days of very foul weather. Parmelee, ensconsed in his sleeping-bag, did all the work of observing and recording from 7:45 on. The evening was gray and foggy. Fine rain fell. By 10:40 visibility was so poor that Parmelee was obliged to move his sleeping-bag to the very base of the nest-wall. By 11:30 it was so dark and raining so hard that he could not see properly even at close range. He could distinguish the female from the male bird (birds?), but had difficulty in being certain that the incoming bird had food in its mouth.

When he stopped his work the wheatears still were busy carrying food, despite the rain and semi-darkness.

Two facts about this 14-hour period of observation are notable: First, rarely during the entire period did either parent (or the "extra" male) spend more than a few seconds at a stretch at the nest; the comings and goings of the birds were virtually incessant. The young certainly were not brooded much—if at all. Second, the adult birds made 367 trips to the nest with food. The average period between feedings was two minutes and 12 seconds. The total number of feedings by the female was 171, by the two males, 196.

In obtaining food the wheatears usually flew out of sight either round the mass of rock to the east, northeast, or north, or downslope a considerable distance. Occasionally they found food within a few rods of the nest. Most mouthfuls of food brought in were large, but when a bumblebee (*Bombus arcticus*) or butterfly was captured, that insect usually was brought in separately. At 11:37 a.m., the female brought in a large bumblebee. While it was at the nest another bumblebee flew past us downslope. The female wheatear must have seen or heard this bee, for she promptly left the nest and gave chase. She snapped at the bee fiercely several times, but it escaped.

Infrequently an adult went to the nest without food, but such visits were exceedingly brief. In approaching the nest the birds alighted first on a narrow projection near the nest-crevice, then hopped and fluttered across the rock-face to the nest-crevice proper. Only occasionally were the female and a male at the nest at the same time, and the two males were never, so far as we could tell, at the nest together. If the female was perching on the projection when the male came from the nest, she fluttered her wings. Never, however, did we see a male give food to the female: the males and the female all gave food directly to the young. If, on leaving the nest, the male met the incoming female in midair, he gave a short, not very loud song while flying. The female also sang a short song in flight whenever, on leaving the nest, it met the incoming male. Whether the "extra" male sang, or was sung to, in this fashion we did not know.

Both male and female birds carried off fecal sacs. While carrying these they flew rather slowly, usually in a straight line, employing a measured, fluttering wing-beat. They invariably carried the sacs downhill. Most sacs they carried 40 to 60 yards, dropping them from three or four feet in air; but occasionally they alighted, placed the sac on the ground, and jabbed at it as if trying to break it up or shove it into the moss. Many sacs they carried westward, dropping them from the air just beyond a large snowbank. A male bird dropped one sac while hovering about four feet above the ground. We were not sure that the "extra" male carried off fecal sacs. During the 14-hour period of observation 74 fecal sacs were carried from the nest, 37 by the female, 37 by the male (males?). Never did a bird leave the nest with a fecal sac without first having delivered food to the young.

Our presence near the nest undoubtedly reduced the total number of feedings somewhat. Occasionally one of the birds stopped food-gathering for a short time, approached us closely, and called *check-check-check-check-weet,* or *weet-check,* excitedly. At 4:04 and 4:09 p.m., one of the males gave sudden violent chase to a male Lapland Longspur which was singing flight-songs close by. Why the wheatear suddenly objected we could not understand, for the longspur had sung literally scores of songs without rousing the slightest animus. Two or three times one of the male wheatears chased a Snow Bunting briefly. Several times we saw a lemming (*Lemmus trimucronatus*) making its way along a fissure about 30 feet from the wheatear nest. The birds paid no attention. Neither did they seem to mind in the least the pipits which often flew past the nest-crevice or fed in the mossy area just below the nest. At 4:49 p.m., a Peregrine (*Falco peregrinus*) flew low past the nest-rock. No wheatear was in sight at the time.

Table 1

Record of Feedings at a Greenland Wheatear Nest, June 28, 1953

Food was brought by the parents and also by an "extra" male which was indistinguishable most of the time from the male parent. An asterisk indicates fecal sac removal after food delivery.

A.M.		12:08	F	2:10	M	4:17	F	5:47	F	7:27	M
9:45	M	12:13	F	2:11	M	4:18	M	5:49	M	7:31	M
9:55	F	12:14	M	2:12	F	4:20	M	5:51	F	7:32	M*
10:05	F*	12:20	M	2:13	F	4:21	F	5:53	M	7:33	F
10:07	M*	12:22	F	2:16	F	4:22	M	5:58	M*	7:36	M
10:11	F*	12:23	M	2:17	F	4:23	F	6:01	M*	7:37	F
10:12	F	12:24	F	2:23	M*	4:24	M	6:04	M	7:41	F
10:16	M	12:25	F	2:24	F	4:26	F	6:07	F*	7:42	M
10:25	F	12:26	F	2:26	M	4:27	M	6:10	M	7:44	M
10:27	M	12:30	F	2:33	M	4:29	F	6:14	M	7:44	F
10:31	M	12:35	M	2:36	F	4:31	M	6:15	F	7:54	M
10:33	M	12:37	F	2:37	F	4:33	M	6:21	M	8:02	F*
10:34	F	12:40	M	2:38	M	4:35	M	6:22	F	8:03	F*
10:47	F*	12:44	F*	2:39	M	4:36	F	6:23	F	8:07	F
10:48	M	12:45	M	2:40	F*	4:37	M	6:25	M	8:12	M
10:49	F	12:50	F	2:42	M*	4:38	F	6:26	F	8:12	F
10:50	M	12:51	M	2:46	F*	4:38	M	6:30	F	8:14	F
10:55	M	12:55	F*	2:50	F*	4:40	M	6:31	M	8:18	F*
10:57	M	12:56	F	2:51	M	4:41	F	6:31½	F*	8:20	F
10:59	M*	12:58	M	2:51½	M	4:42	F	6:32	F	8:20	M[1]
11:00	F	12:59	F	2:52	M	4:44	M	6:33	M	8:22	F*
11:02	F*	1:00	M	2:56	F*	4:44	F*	6:34	F*	8:23	F
11:05	M*	1:03	F	2:57	M	4:45	M	6:35	F*	8:24	F*
11:06	F	1:04	M	2:58	F	4:45	F*	6:35½	F	8:25	M
11:06½	M*	1:04½	F	2:59	F	4:46	M	6:36	M*	8:26	M
11:08	M	1:08	M	3:01	F	4:49	F	6:40	M	8:29	M
11:10	M	1:09	M	3:02	F	4:50	M	6:41	F*	8:30	M
11:13	F	1:14	M	3:04	M*	4:51	F	6:42	M*	8:31	F
11:15	M	1:15	F	3:08	F	4:56	F	6:43	F	8:33	F
11:16	F	1:20	M	3:09	M	5:00	F	6:50	M	8:35	F
11:20	M*	1:21	F	3:18	F	5:02	F*	6:51	F*	8:38	F
11:21	F	1:23	M	3:25	M	5:03	M*	6:52	M*	8:39	M
11:24	F	1:24	M*	3:26	F	5:07	M	6:53	M	8:43	F
11:25	M*	1:25	M	3:30	M	5:07	F	6:57	F	8:43	M[1]
11:35	F	1:26	F	3:32	M	5:10	F	6:59	M	8:44	F[1]
11:37	F	1:27	F	3:33	F*	5:12	M*	7:00	M	8:48	M
11:40	F	1:27	M	3:38	F*	5:14	M	7:02	M*	8:48	F
11:41	M*	1:30	F	3:40	F	5:15	F	7:04	M	8:50	M[1]
11:42	F*	1:31	F	3:41	F	5:19	F	7:06	M	8:53	F
11:44	F	1:32	M	3:43	M*	5:20	F	7:07	F*	8:54	M
11:47	F	1:36	M	3:44	M*	5:23	F	7:10	M	8:55	F[1]
11:47½	M	1:36½	F	3:45	M	5:25	M	7:11	M	8:58	F
11:52	M	1:38	M	3:47	M	5:27	M	7:11	F	9:00	F*
11:55	M	1:40	F	3:54	F	5:30	M*	7:14	F	9:05	M
11:56	F	1:42	M	3:56	M*	5:30½	F	7:14½	M	9:07	F[1]
11:56½	M	1:46	M*	3:56	F*	5:30½	M	7:16	F	9:08	M
11:57	M	1:50	M	3:58	F*	5:36	M	7:17	M	9:09	M
11:59	M	1:56	M*	4:00	F	5:38	M	7:18	M	9:10	M[1]
12:00	F	2:00	M*	4:01	M	5:38	F	7:19	F	9:10	F[1]
		2:02	F	4:02	F	5:39	F	7:20	M	9:12	M*
P.M.		2:05	M*	4:04	M	5:41	F*	7:21	F*	9:15	M
12:01	M	2:07	F	4:08	F	5:43	M*	7:23	F	9:16	F
12:05	M*	2:08	M	4:09	M	5:45	F	7:24	M	9:20	M
12:07	F*	2:09	F	4:13	M	5:46	M	7:25	M	9:23	M

[1] Feeding of young bird outside the nest-crevice.

Table 1 (Continued)

9:24	M	9:46	M*	10:00	M	10:17	F	10:35	M	11:11	F
9:27	M	9:47	F	10:05	M*	10:20	M	10:39	F *	11:20	M
9:30	M	9:49	M	10:06	F *	10:22	M*	10:40	M*	11:21	F
9:31	M	9:50	F	10:07	M	10:24	M	10:50	F	11:25	M
9:36	F	9:53	M	10:08	M	10:25	M	10:55	M	11:29	F
9:36	M*	9:54	M	10:10	M	10:28	M	11:00	M	11:30	M
9:38	M	9:55	M	10:13	M	10:29	F	11:03	F		
9:45	F *	9:57	F	10:16	M*	10:33	M	11:10	M		

At 8:20 p.m., one of the young wheatears made its way to the mouth of the nest-crevice and scrambled or fell to a narrow shelf about four feet below the nest. Here it received food for over an hour (see table 1). At 9:25 p.m., Parmelee noticed that he could no longer see this bird. Wondering what had happened, he investigated, finding it drowned in the meltwater pool. It had been dead a very short time. The adult wheatears continued to make trips to the shelf on which it had been, but they did not fly to the bottom of the nest-wall.

From 10:40 to 10:50 p.m., no adult wheatear took food to the nest: Parmelee was moving his sleeping-bag closer, and the birds were greatly perturbed. From 11:13 to 11:20 p.m., there was great excitement and a complete cessation of food-carrying: a Snowy Owl (*Nyctea scandiaca*) was flying about the nest-rock menacingly. From 11:18 to 11:20 the great bird hovered almost directly over the nest. Nicholson (1930:306-307) discusses in detail interruptions in feeding by parent wheatears caused by "frequent visits" of a family of Gyrfalcons (*Falco rusticolus*).

Parmelee discontinued his observations at 11:30 o'clock. At the Base we examined the dead nestling. It was very stub-tailed. We decided that it had left the nest prematurely, perhaps as a direct result of our attempt to handle the nest contents that afternoon.

The four days following June 28 were gray and disagreeable. On our several visits to the nest during this period we observed nothing in any way comparable to the amount of activity we had witnessed on June 28. Could the adult birds have sensed on that date that bad weather was ahead of them; that incessant gathering of food was necessary if the big brood was to be kept alive? Or were the insects themselves unusually active on the bright day and the birds merely slaves to their instinct in continuing to obtain food as rapidly as possible so long as it was available? During the four inclement days insects must have been very hard to find. Three of a brood of four young Horned Larks which we had been observing died during this bad spell, probably from shortage of insect food.

On July 2 (much fog) we went to nest 2 at 4:50 a.m., finding all quiet, except that a male Lapland Longspur was singing flight-songs nearby. At 5:10 we heard a rough *bjee*—the food-cry of a young wheatear. At 5:20 a male Snow Bunting alighted near the nest-crevice and the young wheatears raised a great clamor. We had never heard a comparable noise on the arrival of an adult wheatear. The cries subsided when the bunting flew away. Surprised because no wheatear had driven the bunting off, we went to the nest-crevice and found (1) a young wheatear, hunched up but very spry looking, at the edge of the meltwater pool below the nest; (2) a dead nestling, of about the same size as the living one, in the water a few feet away; and (3) several dead hairless lepidopterous larvae, each about an inch long, also in the water. While we were picking the dead bird up, an adult male wheatear darted from a deep crack about four feet above the nest-crevice. We believe it had been asleep there, perhaps in a much-used roosting place. It flew past us, alighted on a rock about 20 paces off, and began calling *chack*. Then the female appeared. The young wheatear at the edge of the meltwater pool was short-tailed, but obviously much older than the bird which had left the nest on June 28. The brood now numbered five.

In the afternoon Parmelee returned to nest 2 to obtain photographs of the young birds leaving the nest. He failed to find any birds at all for a time; then an adult male appeared, flying toward some rocks several rods to the southwest of the nest. Investigating promptly, Parmelee found two young birds, both short-tailed but well able to fly. One darted off, keeping up with the adult without much difficulty. The other stayed quiet long enough to be photographed, then flew off, alighting in a pool. Here it propelled itself sturdily to safety, using its wings.

Fig. 3. Left. Young Greenland Wheatear just after leaving nest 2; Frobisher Bay, Baffin Island, July 2, 1953. The blurred light area directly above the head is natal down, thrown slightly out of focus by the wind.

Right. Young Greenland Wheatears in nest 4; Frobisher Bay, July 16, 1953. The rock above the nest has been removed. Note absence of natal down from head of bird to right. There was very little space between the nest-cup and the rock above it and the down probably was worn off during feedings.

On July 3 we went to nest 2 about 5:00 a.m. The nest was empty. We failed to find any wheatear—either young or adult—for some time. Then, off to the north, we heard a rough *bjee* and knew that a young wheatear was begging for food. We found the fledgling on an inaccessible ledge. Tossing pebbles at it, we frightened it into a crevice. Presently it emerged and flew rapidly straight across a snow-filled gulch. We caught and banded it. It was not very strong on its legs and we left it with misgivings, for it seemed to be quite abandoned by its parents.

That afternoon, in hilly country a mile or so north of the Base, we saw wheatears several times. One adult, a female we thought, flew from a cliff below us just as we flushed a Rough-legged Hawk (*Buteo lagopus*) from its nest. The wheatear must have been feeding only a few yards from the hawk's nest. On a hilltop two hundred yards east of the hawk's nest we happened upon a pair of wheatears. They flitted off downslope and were soon out of sight. We may have found this pair's nest on our way back to the Base. Near the top of a great bluff overlooking the flat on which the Base stood, we became suddenly aware of the presence of two wheatears—a male and a female. The male quickly disappeared—in the direction of the quarry; but the female suddenly entered a narrow opening beneath a rock. We could scarcely believe that it had gone to the nest, for it had uttered no cry of alarm. But when it failed to reappear we investigated, finding that there was a considerable space beneath the rock. At first we could see nothing at all

under the rock; but presently we descried the bill and eye, then the head and neck, of the female and the edge of the nest. Since it had gone to the nest without food we assumed that she was incubating.

An hour or so later we returned with camera equipment, hoping to photograph a nestful of eggs. Both the male and female wheatear greeted us, scolding energetically. The male soon left, but the female remained. We looked under the rock and clearly saw a young wheatear, large and well feathered. The mother was very solicitous at first, but became gradually less demonstrative, eventually seeming to lose interest. Puzzled over this behavior, we moved the rock, caught and banded the young bird (which flew strongly about 20 yards), and examined the nest. Its contents were two unspotted blue eggs, both slightly broken and glued to the feathers and grasses of the lining, and a great mass of feather-sheath particles. Part of the brood obviously had left. The oldest young were probably being cared for by the male. The female was still bringing food to the youngest of the brood. She may have been caring also for one or more young outside the nest. The two eggs had been cracked while they were quite fresh; there was no sign of an embryo in either. The nest was about 15 inches back from the entrance. The nest-rock was on a steep slope about six feet above fairly level, not very stony, ground. The nest was thin-walled. It was made of grasses and dead plant-stems, lined with feathers and fine grasses. The nest and the cup into which it fitted were surprisingly damp—almost wet.

On July 4 we visited nest 2 for the last time. Near the sprawling nest-rock we came upon the female parent and two of her brood. We expected to find the young cowering in a sheltered place—but instead they were on the tops of the rocks, flouncing about with their mother, calling *chack,* and giving every evidence of being in excellent condition. The female was feeding them, but they were no longer using the *bjee* food-cry. No other young was seen.

On July 8 we found wheatear nest 4. We had started to walk toward the top of a little ridge just west of a bunting's nest when we heard loud wheatear alarm notes on the other side. On reaching the top we saw not far below us a Raven (*Corvus corax*) and a pair of agitated wheatears. The Raven, on seeing us, made off immediately, and the wheatears melted away as soon as the Raven had gone. Later that morning we returned, watched from the little ridge, and saw the female wheatear, with food in her mouth, go under a not particularly large rock which rested on a slope near the spot from which the Raven had flown. Just below the opening she had entered lay an egg broken in on one side. It contained a large, dry embryo which obviously had been dead for some time. Remarkably enough the Raven, which must have been foraging, had not eaten it. (There is, of course, the remote possibility that it had not been lying there at the time of the Raven's visit.) Having decided not to roll the rock over until we knew a bit more about the parent birds, we tried to ascertain what was in the nest. The crevice was too narrow for the hand. We thought we could see, in the half-light, the head of a young bird sticking over the edge of the nest.

In the afternoon we returned to the nest. The whole area seemed lifeless. Using a mirror, we threw light under the rock and thought we could make out the bill of a young bird; then suddenly we saw the adult female as she hopped swiftly from the nest, paused an instant, and retreated into the darkness. We tried to force her out by striking the rock with a pebble, but she would not leave. We propped a net against the rock and waited. Within about ten minutes she flew out, straight into the net. We banded her and let her go. She flew about 15 yards, alighted on a rock, shook herself violently, bobbed, called *chack,* and about-faced to scold us.

The following morning (July 9) we went to nest 4 early. The female was there, calling *chack* as usual, and carrying food under the rock. We did not see a male. Lifting one end of the rock, we found that the nest contained three young and one highly translucent egg. The young made no attempt to get away. They were probably about a week old. We collected the egg, which contained a small dead embryo.

On July 10 we visited the nest again, this time seeing a male, which called *weet* and *weet-chack*, call notes we had never heard the female use.

On July 10, Parmelee made a surprising discovery. While returning to the Base from the "HBC River" (our name for a stream which emptied into the bay near the Hudson's Bay Company post), he came upon a male and female wheatear and at least four well developed young. Knowing that we needed another adult male specimen, he decided to collect the male parent if he could. Watching that bird closely, he readied himself for a wing-shot. As he approached the rocks near which he had last seen it, a wheatear suddenly burst out, he shot, and the specimen fell. On picking it up, he found it to be a *young* bird, the very one we had banded near nest 2 on July 3. This, then, was the brood from nest 2, fully a mile and a half from the deserted nest, still together, still receiving food from their parents! The young bird, which we had given up for lost, had fared well. It was in excellent condition. A few long strands of natal down still clung to the plumage of its hind neck.

On July 11 we visited nest 4, finding the female busy feeding the young. We saw no male anywhere in the vicinity. We lifted the rock and banded the three young, which made no attempt to bolt when we took them from the nest. The nest was clean but damp. It was completely free of mites or other parasites, so far as we could see.

On July 16 we took photographs of the young in nest 4. While we were moving the rock so as to expose the nest, the young birds bolted, and we mortally injured one of them. On July 23, not far from the nest-site, we saw the banded mother and a banded young one. What had happened to the other young bird we did not know.

Two unbanded young wheatears which we observed for some time near the dump just west of the Base on July 31 were in the midst of the postjuvenal molt. Their tails appeared to be full-grown. An adult female and two young birds which we saw August 1 along the shore of Tarr Inlet also were molting. Two wheatears which we saw just north of the Base on August 2 appeared to be in fairly complete first winter plumage. These birds were feeding along the edge of a bare, gravelly area. On August 3, 4, and 5, at the Hudson's Bay Company post, we repeatedly saw an adult female and from two to four young—all of which were molting.

PROSPECTS FOR ESTABLISHMENT OF THE SPECIES

Several authors, notably Forbes (1938:495) and Shortt and Peters (1942:347), have voiced their belief that the Greenland Wheatear was becoming more common on Baffin Island. Whether or not this apparent increase was actually an increase in observers or observations rather than of birds, we wish to point out that what we witnessed of wheatear nesting behavior at Frobisher Bay convinced us that the species is remarkably hardy. Not one of the four nests we observed was wholly unsuccessful. True, some eggs did not hatch. True, two young drowned shortly after leaving one of the nests. But that very nest contained seven well developed young when we found it, and at least four of the brood fledged successfully despite a very bad spell of weather. Another nest held four well developed young when we found it, and three of these fledged successfully (four probably would have fledged had we not collected one). Thus, 15 of 19 eggs hatched and 11 of the 15 nestlings apparently fledged successfully.

Choice of nest-site certainly is an important factor in this species' success. Each of

the four nests we found was hard for a man to reach with his hand and about equally hard for a raven to reach with its bill, or an owl or peregrine to reach with its bill or foot. Neither foxes (*Alopex lagopus*) nor weasels (*Mustela erminea*) were at all common in the Frobisher Bay area in the summer of 1953. A fox could hardly have reached any of the four nests. A weasel could have reached two of them easily, one with difficulty, one with great difficulty—if at all. Certainly the wheatear is now well established in Greenland and in Baffin Island, and its range may well be increasing. What we observed and have reported above leads us to believe that *Oenanthe oenanthe* may well have a completely circumboreal breeding distribution within the next century or so.

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SUMMARY

1. Several pairs of Greenland Wheatears nested in rough country near the United States Air Force Base at the head of Frobisher Bay, Baffin Island, in the summer of 1953. We found four nests, all within about a mile of the Base. Two of these were in crevices in vertical rock-walls, two under large rocks.

2. None of the four nests had been used before. We found no evidence of double-broodedness.

3. Nest 2 held seven well developed young when we found it June 25. During a 14-hour period on June 28 this brood was fed continuously by the parent birds and at least part of the time by an "extra" adult male. The three adults made 367 food-trips. Among the food brought in were bumblebees and butterflies. This great activity immediately preceded a four-day spell of vile weather during which insect food was very hard to obtain.

4. A male wheatear, busy feeding young at nest 2, sang brief, not very loud songs in flight when, in leaving the nest after food delivery, he met the incoming female. The female also sang briefly when, on leaving the nest, she met an incoming male.

5. Eight days after the brood had left nest 2, the entire family (male, female, and at least four young) were together a mile and a half from the nest. The young were still receiving food from the adults. Natal down still clung to the plumage of at least one of the brood.

6. In nest 3, found July 3, there were two eggs (broken some time before), one well developed young bird, and evidence (particles of feather-sheath) that other young already had fledged. In nest 4, found July 8, there were three young several days old and a translucent egg; outside the nest, about two feet away, was another egg (broken).

7. A wary, unapproachable male, which sang a great deal, apparently had no mate or nest all season.

8. In the four nests a total of at least 19 eggs were laid. Of these, four did not hatch. Of the 15 nestlings, two drowned—possibly because of leaving the nest prematurely; one was mortally injured while we were moving the nest-rock; and one we collected as a specimen.

9. *Oenanthe oenanthe* is now well established, at least locally, in Baffin Island.

LITERATURE CITED

Forbes, J. R.
1938. Recent observations on the Greenland Wheatear. Auk, 55:492-495.
Kumlien, L.
1879. Contributions to the natural history of Arctic America, etc. U.S. Nat. Mus. Bull., 15: 69-105.
Nicholson, E. M.
1930. Field-notes on Greenland birds. Ibis, 1930:280-313; 395-428.
Shortt, T. M., and Peters, H. S.
1942. Some recent bird records from Canada's Eastern Arctic. Can. Jour. Res., Ser. D, 20:338-348.
Soper, J. D.
1928. A faunal investigation of southern Baffin Island. Bull. Nat. Mus. Canada, 53:76-116 (Birds).
1940. Local distribution of eastern Canadian arctic birds. Auk, 57:13-21.
1946. Ornithological results of the Baffin Island expeditions of 1928–1929 and 1930–1931, together with more recent records. Auk, 63:1-24; 223-239; 418-427.
Sutton, G. M.
1930. [Quotation from letter written on board the *Nascopie,* August 12, 1929, in Hudson Bay.] Cardinal, 2:204-205. [The "Lake Harka" referred to is Lake Harbour, Baffin Island.]
1947. Greenland Wheatear in southern Baffin Island. Auk, 64:324-325.
Taverner, P. A.
1934. Birds of the Eastern Arctic. *In* Canada's Eastern Arctic, pp. 113-128 (Department of the Interior, Ottawa).
Wynne-Edwards, V. C.
1952. Zoology of the Baird expedition (1950). I. The birds observed in central and south-east Baffin Island. Auk, 69:353-391.

Department of Zoology, University of Oklahoma, Norman, Oklahoma, January 26, 1954.

FROM FIELD AND STUDY

Ross Goose in the Eastern Arctic.—As far as the writer is aware, there are no published records of the Ross Goose (*Chen rossii*) in the Canadian eastern arctic. In the summer of 1953, two adult females were trapped, banded and released at the mouth of the Boas River, Southampton Island, District of Keewatin, N.W.T. This is approximately 550 miles southeast of Perry River, the only known breeding grounds. The Perry River breeding grounds were first reported by Gavin in 1940 (Beaver, Dec., 1940:6-9). His popular account was summarized by Taverner (Can. Field-Nat., 4, 1940:128-130). More recently the area has been re-investigated by Scott, Hanson and Queneau (Rept. Arctic Institute North America, 1949:1-5).

The Ross Geese banded in 1953 were captured accidentally during the course of a banding drive for Blue Geese (*Chen caerulescens*) and Snow Geese (*Chen hyperborea*) while these were undergoing their postnuptial molt. In the past two seasons a total of 30,000 geese, including retrapped birds, have been handled in the pens (Cooch, Jour. Wildl. Mgt., 17, 1953:460-465). In addition nearly 5000 nesting pairs have been examined, but no indication of the presence of Ross Geese was previously obtained. Sutton (Mem. Carneg. Mus. II, Sect. 2, 1932:1-275), Manning (Auk, 59, 1942:158-175), and Bray (Auk, 60, 1943:504-536) did not find Ross Geese on the island. In addition, the Eskimos of Southampton Island have no name for this goose. This can be taken as good evidence that the bird is a recent arrival or a vagrant in the area, as the Eskimos have names for all other species of birds and mammals on the island. The work done in 1952 and 1953 was concentrated near the coast, which was the area occupied by the greatest number of nesting geese. Both of the Ross Geese were taken during banding drives which extended twice as far inland as our other activities. This part of the area has numerous small lakes, and the upper reaches of the Boas delta is a maze of islands which could provide suitable habitat for Ross Geese.

All species of geese commonly nesting at Boas River undergo a differential postnuptial molt. Nonbreeding subadults (yearlings), begin their molt at the time when goslings are hatching. They have regained power of flight when the successful breeding adults enter their molt. Adult birds which did not nest molt with the subadults, while those which had lost their nests molt at an intermediate time. Thus, banding drives made for adults and their broods do not capture nonbreeding birds. If the same type of molt phenology occurs in the Ross Goose (Scott, *et al.*), the birds which were trapped by us would be considered as having bred. The unburst primary sheaths on both birds were less than 15 mm. in length, indicating that the primaries had been dropped within the week. This compares favorably with measurements made on the other species of *Chen*. This is not conclusive evidence that the Ross Geese were breeding. However, a few moments before the first adult was discovered, an "aberrant" Snow gosling was handled. The writer was unfamiliar with the coloration of downy goslings of the Ross Goose. This particular bird was noted because of its small size and the yellow head with a grayish body. Although Lesser Snow Goose goslings are quite polymorphic, none has ever been noted with this particular pattern.

Migration records of the Ross Goose east of Saskatchewan are rare. Seton (Auk, 25, 1908:450-454) mentions one shot at Portage la Prairie, Manitoba, in September, 1902. Macoun (Catalogue of Canad. Birds, 1909) calls the species rare at Churchill River. There are a few unpublished kill records from Manitoba in the past 30 years. McAtee (Auk, 27, 1910:337-339) reports a specimen taken at the mouth of the Vermilion River, Vermilion Parish, Louisiana, February 10, 1910. He also reports specimens taken in Chihuahua, Mexico. As far as is known the Ross Goose has never been reported from James Bay. On October 13, 1953, the writer was presented with an adult female which had just been shot by a Cree Indian. Upon further questioning it was learned that this man had killed two birds like it in 1939. This specimen is now in the collection of Constable Paul Holmes, R.C.M.P. It was interesting to note that the adult female shot in James Bay in October, 1953, was taken from a "family" group of Blue Geese. The other adult bird in this flock was killed and proved to be an adult male Blue Goose. The young were all of the Blue Goose type.

Thus, in 1953 three definite records of the Ross Goose occurring near Hudson and James bays were obtained. Grateful acknowledgment is made to the Arctic Institute, the Office of Naval Research and the Canadian Wildlife Service for providing funds in support of this study.—GRAHAM COOCH, *Canadian Wildlife Service, Ottawa, Ontario, February 19, 1954.*

Further Notes on Red-throated Loons Nesting on Vancouver Island, British Columbia. —Earlier (Condor, 48, 1946:262) I recorded the nesting of the Red-throated Loon (*Gavia stellata*) near Courtenay on Vancouver Island, in the years 1942–1944 and its absence there in 1945 and 1946. As the loons have since nested on the same lake, it seems desirable to bring the record up to date.

In 1947 one visit was made to the lake on May 16, and over an hour was spent there, but no loon was seen.

The first visit in 1948, on July 7, showed a bird loafing at the south end of the lake where it stayed, not going near the old nest site. An examination with 7× binoculars of the shore line of the island revealed distinctly a nest which showed up as a brown patch of dead material contrasting with the surrounding vegetation. A loon could be seen moving about on the nest. On July 31, no bird was visible and the nest was now more or less hidden by the vegetation; one arrived from the direction of the sea, some seven miles away, and after some delay, it approached the nest from the land side and settled down. The other member of the pair was also present. Two weeks later, on August 14, there was one bird floating in front of the nest site, and soon a young bird swam out from the nest to join the parent bird, who swam out some yards. The other young bird could be seen resting near the nest. At 11:20 a.m., the male arrived. The male alighted with quite a splash some yards out; the female called a rather modified *garr* and, accompanied by both young, swam to meet him. The male had in his beak a fish resembling a shiner (bright silver and flat). After considerable knocking of the fish about in the water, it looked as though both young took hold of it and it disappeared, the parents watching the proceedings.

After this the female and young returned to cover, the male swimming out into the lake, splashing vigorously and preening, ducking his head and turning on his side exposing the white underneath, just as one sees the Common Loon (*Gavia immer*) so often do. The female also swam out and preened.

The male called and was answered by the female with a note I have never heard before, *oh-eh,* drawn out and suggesting an animal crying out in pain (not unlike one of the calls of the Common Loon but higher pitched and not so loud). The male called again but the female did not answer and swam to the nest from where she soon appeared with the two young, but this time she seemed careful to keep near cover. A vulture (*Cathartes aura*) flew over and the male *mee-owed*. This is apparently a warning note as the female and young disappeared into cover.

Shortly afterwards the whole family was swimming in the middle of the lake, each youngster attaching itself to one parent; in comparison the young looked from one-quarter to one-third the size of the parents. One young was smaller than the other.

At 1 p.m. both adult birds swam out from near the nest, the female leading. After she had indulged in a little preening, there was a form of display, the female swimming with neck fully extended at an angle with beak pointed upwards, the male following close behind, almost touching her, also with his neck extended at an angle but with the beak pointed downwards. These positions were maintained for only a few seconds. This was the only display seen.

After the male left, the female with one young swam out; she called a low *cuck-cuck* note and the other young followed. For the next hour they loafed. Sometimes one young would swim off by itself some yards, the smaller bird seeming to be the more venturesome. Sometimes they would return to the shelter of the overhanging brush. I did not see the parent dive at all; but on this occasion each of the young did, remaining under water quite an appreciable time. This diving did not seem to result in the capture of food. I never saw the female make any attempt to feed the young during the nearly two hours they were under observation after the male had left. Shortly after leaving the lake I heard the *mee-ou* note which may have indicated the male returning with food. A little fish, only 2-3 oz. seemed meagre rations for the young in over two hours and the female, as far as I saw, had nothing.

In 1949 I paid two visits to the lake, on July 6 and September 2, but no loons were seen.

On July 27, 1950, there were two adults and one young about half grown; one parent had a fish, silvery and 4-5 inches long, which it fed to the youngster. This young bird and a parent were seen also on August 16.

In 1951, no loons were seen on June 18, but on July 7, at the nearest point on the sea, I heard the harsh *garr* note of the Red-throat.

In 1952, no loons were seen on May 25 nor later when the lake was visited by a friend.

In 1953, on July 24, two loons were seen on the lake briefly. None was recorded on September 16.

To compare the results of my observations with those set forth by Bent (Life Histories of North

American Diving Birds, 1919:82), he reports eggs from arctic areas from May 10 to July 25. The nesting period at the much lower latitude of Vancouver Island would appear to be similar, as indicated by the extreme dates May 8–July 31 when loons were observed on nests.—THEED PEARSE, *Comox, British Columbia, February 2, 1954.*

Multiple Use of Cliff Swallows' Nests by Bird Species.—While studying the relationships of birds to equine encephalitis, the senior writer on a number of occasions has found English Sparrows (*Passer domesticus*) making use of Cliff Swallow (*Petrochelidon albifrons*) nests, as recorded by Bent (U. S. Nat. Mus. Bull. 179, 1942:478-479). Occasionally Cliff Swallows and English Sparrows have been noted nesting as close as in adjacent nests. On a few occasions Cliff Swallows, Barn Swallows (*Hirundo rustica*), and English Sparrows have been found nesting fairly close together under the same bridge and with Barn Swallow nests at times attached to points where old Cliff Swallow nests had been in previous years. English Sparrows have been commonly found making use of Cliff Swallow nests in winter in Weld County, Colorado. When one considers the shelter that can be afforded to other small birds in winter by the Cliff Swallow nest structures, it is not surprising that the writers have found three other species using these for night roosting places in the northern part of Larimer County, Colorado. While collecting specimens from Cliff Swallow nests and birds inhabiting these nests, the writers recorded the Rosy Finch (*Leucosticte tephrocotis littoralis* and *L. t. tephrocotis*), the Black Rosy Finch (*L. atrata*), and the Canyon Wren (*Catherpes mexicanus conspersus*) using these nests located on cliffs in canyons about 25 miles north of Fort Collins. Daniels has noted finches on many occasions using Cliff Swallow nests in the mentioned areas over a period of 10 years during the winter months. This interesting use of swallow nests by several species is felt worthy of note also in considering the parasites infesting these structures. The writers have found Cliff Swallow bed bugs, ticks, blood-sucking diptera, and fleas to be very common in these nests. One wonders how much exchange of parasites among the different birds occurs under these conditions.

While this note was in press, an additional record of interest was obtained. On May 25, 1954, Bennington found a Say Phoebe nesting in an old Cliff Swallow nest at the same locality, where in the winter months, Canyon Wrens and Rosy Finches made use of them.—CLARENCE A. SOOTER, E. E. BENNINGTON, and LESLIE B. DANIELS, *Public Health Service, Greeley, Colorado,* and *Colorado A. and M. College, Fort Collins, Colorado, April 28, 1954.*

Status of the Wood Ibis in San Diego County, California.—During the summer months in 1948, and from 1950 to 1953 (no observations were made in 1949), the Wood Ibis (*Mycteria americana*) was noted in some coastal sloughs and estuaries of San Diego County. The number of individuals frequenting the area in 1953 showed a marked increase over those seen in the previous years listed or indicated by published records. In the San Dieguito River mouth eight were seen on several occasions in July, 1948; a few were present in 1950 and 1951; sixteen occupied the area during the summer of 1952; on July 24, 1953, in contrast, seventy-eight were observed at dusk in flight from San Elijo Lagoon, at Cardiff-by-the-Sea, to an area about two miles east of Del Mar, in the San Dieguito River drainage. What appeared to be the same birds were repeatedly observed during July, August and September feeding by day on the flats and in the shallow waters of San Elijo Lagoon and retiring at night to the San Dieguito River area. While feeding they frequently churned the mud by vigorous stomping. Flights of the Wood Ibis over Solano Beach were seen daily at sundown and were also heard during the early hours of darkness as the birds continued to move to the resting area. Communication between the birds during night flight was often maintained by a continued chorus of hoarse croaks each answered by a high-pitched peep. The progression of flight during darkness was accomplished by circular soaring with gradual movement in the desired direction. Daylight flights were ordinarily more direct, although the soaring was observed on one occasion. In the absence of moonlight, observations of night flights were often possible by city light reflected from low overcast.

A flock of approximately 300 Wood Ibises was noted during July and August, 1953, just south of Oceanside in the Buena Vista Lagoon, which is being vigorously supported as a bird sanctuary. Local observers stated that this was the first occurrence of Wood Ibis on this lagoon since 1948. A few stragglers were also noted in Sorrento Slough and in Mission Bay. Over the Sorrento Slough six birds were observed soaring to a height of approximately 2000 feet only to climax the affair by plummeting to about 200 feet from the ground. The birds did not repeat this but settled down in shallow water.

This large migratory influx of Wood Ibis in 1953, presumably from the west coast of Mexico, is heartening to ornithologists who have watched with much anxiety the encroachment of commercial, recreational and flood control development in the slough, lagoon and shallow bay areas of southern California during recent years. As the available feeding grounds face severe reduction due to such development, we may be on the eve of seeing fewer, instead of more, of these American storks.—ANDREAS B. RECHNITZER, *Scripps Institution of Oceanography, University of California, La Jolla, California, March 17, 1954.*

A Further Record of the Slaty Finch in México.—The Slaty Finch (*Spodiornis rusticus*) is a distinctly rare bird in Central America and southern México. Until 1939 only the male type of the Mexican form (Veracruz), *Spodiornis rusticus uniformis,* was known. In 1943 Brodkorb (Auk, 60, 1943:281) recorded a female *Spodiornis* taken on Volcán Tacaná in Chiapas and referred it to *uniformis,* treating the latter as a species. Some uncertainty about the identification was expressed since the adult female of the Central American and Mexican forms were unknown and comparison perforce was made with an Ecuadorian example of *S. rusticus.* Another specimen of *Spodiornis* from Chiapas is contained in the Moore Collection, where it was tentatively identified by Moore as to genus some years ago. It is a female taken on Volcán Tacaná on May 1, 1943, by M. del Toro Aviles. The elevation is recorded as 3000 meters, but this is probably only an approximation. Some of the same problems that confronted Brodkorb still face us in identifying such a female, as no pair of *Spodiornis* has been taken in association north of South America. The specimen of 1943 has, however, been compared minutely with respect to bill structure, feet, wing, and tail with males and adult, laying females of *S. rusticus* from Colombia (Norte de Santander) and with the type of *S. r. barrilesensis* from Panamá. There seems to be no doubt that the Chiapas specimen belongs to this genus and we can see no structural or color characters of a magnitude to suggest that the three disjunct forms of México, Costa Rica–Panamá, and South America should be treated as anything but subspecies, as Hellmayr (Cat. Birds Amer., pt. 11, 1938:369-370) has already done. The real question seems to be whether all the forms are separable racially.

The type of *barrilesensis* was differentiated from *jardinii* (= *rusticus*) by Davidson (Proc. Biol. Soc. Wash., 45, 1932:167-168) only on the basis of form and size of the bill, which was said to be longer and basally broader and deeper, the mandible being quite tumid. Our recent examination of this type, a male, reveals that its bill is distinctly abnormal if we may judge from experience with bills of other finches. This possibility apparently was not appreciated by the describer. The tip of the bill is attenuated and overgrown and the lower mandible is checked and irregular as though it had once been broken or had had some sort of injury. Much of the claimed character of the bill must therefore be doubted. However, it apparently was a bill somewhat more massive at the base than that of *S. rusticus* and the Chiapas specimen now before us indicates the same type of difference. For example the width of the bill at the nostril, although difficult to measure, is 4.7 mm. whereas it is 4.2 in all four *S. rusticus* at hand. Hellmayr (*op. cit.*) in his apparent comparison of the type of *S. r. uniformis* with specimens of *barrilesensis* prior to 1938 reports that it is similar to *barrilesensis* except for size of wing and tail and Brodkorb comments on the larger, stouter bill of his specimen from Chiapas. There seems to be little doubt, therefore, that the representatives of the species in the highlands north of the Isthmus of Panamá are less slender-billed than are those to the south; the difference is of an order commonly seen in subspecies, as for example among the northern races of *Passerculus sandwichensis.*

The problem still remaining is whether *barrilesensis* and *uniformis* are racially separable. The one character claimed to date is greater size of *uniformis.* The wing and tail of the type of the latter as measured by us are 74.5 and 50 mm., respectively. The males of four *rusticus* before us from the United States National Museum are as follows: ♂ ♂ 71.4, 47.0, and (younger ♂) 68.2 and 43.0; ♀ ♀ 67.0, 45.3, and 64.0, 44.0. The type of *barrilesensis,* a male, is 72.1, 47.8; wings of two males in the American Museum from Costa Rica are 72.2 and 73.8 mm. The Chiapas female was reported by Brodkorb to have a wing of 69 mm. and a tail of 46.5 mm. The later Chiapas female measures 64.7 and 44.2. Thus the size of one Chiapas female suggests a somewhat larger form but the second specimen does not. It is quite likely that no statistically significant differences exist in wing and tail length and that the small samples of this rare type of finch have been misleading with respect to these size characters.

The difference between *rusticus* and the Chiapas females in color is also confusing. Brodkorb in comparing his specimen to *rusticus* reports it to be darker, browner, and less olive, and generaliy less yellowish below. The second Chiapas specimen compared with *rusticus* is more olive and yellowish; the back is Saccardo Olive of Ridgway rather than Roman Green and the light brown of the underparts is Old Gold rather than Yellowish Citrine. Probably again this represents individual variation in the species, although it is possible that Brodkorb's bird is not correctly allocated as to species in line with his doubts.

In view of the uncertainty concerning a real distinction between *uniformis* and *barrilesensis* and in view of the priority of the name *uniformis*, it probably is best to list the Chiapas females as *uniformis*. They certainly are not the slender-billed *S. r. rusticus*. Further material may result in more definite suppression of *barrilesensis* in contradistinction to *uniformis*.

We indicate our appreciation for loan or use of material to Herbert Friedmann of the United States National Museum, Robert T. Orr of the California Academy of Sciences, John T. Zimmer of the American Museum of Natural History, and J. D. MacDonald of the British Museum.—ALDEN H. MILLER, *Museum of Vertebrate Zoology, Berkeley,* and ROBERT T. MOORE, *Occidental College, Los Angeles, California, March 16, 1954.*

A Third Record of the Black-throated Blue Warbler in California.—On September 1, 1953, we captured in one of our water traps at Manor, Marin County, California, an adult male Black-throated Blue Warbler (*Dendroica caerulescens caerulescens*). The bird was in fresh plumage, and somewhat to our surprise, it was caught in the trap near our large flight aviary instead of the trap adjacent to our warbler aviary in which most of our "stray" warblers were previously taken. The bird was extraordinarily tame from the start and was "broken off" to artificial food with surprisingly little difficulty. Because of its rarity on the California list, it was not subsequently released in the warbler aviary but was carried over the winter months in a large cage in an indoor bird room. At this writing it is in perfect health and condition.

This is the third California record for this eastern warbler, a female having been collected on the Farallon Islands in November, 1886, by W. E. Bryant (Pac. Coast Avif. No. 27, 1944:401). There is a sight record by Waldo G. Abbott of a male at the Santa Barbara Museum of Natural History, Santa Barbara, California, for October 20–21, 1948 (Condor, 51, 1949:98). A skin will be made of this specimen later for record purposes.—ERIC CAMPBELL KINSEY, *Manor, Marin County, California, April 14, 1954.*

Ross Goose Observations.—Recent observations and records of winter occurrences of the Ross Goose (*Chen rossii*) on the Salton Sea National Wildlife Refuge, Imperial County, California, and adjacent areas are noteworthy. From 1947 through 1949, the writer and U. S. Game Management Agent A. W. Elder received infrequent reports of hunters bagging very small "snow geese" in the vicinity of the refuge. From descriptions it was apparent that Ross Geese were involved. In 1950, U. S. Deputy Agent William Wooten and State Game Warden Guy Noel reported checking a picked Ross Goose at the customs station in Calexico, California.

On December 3, 1951, eight Ross Geese were observed on the refuge at close range by the writer and Mr. William Anderson of the California Fish and Game Department. After that date from one to three were observed often with Snow Geese until spring migration. In 1953, three individuals were seen a number of times. During the regular hunting season two were reported killed by hunters on areas adjacent to the refuge. On December 14, Mr. Eugene Kridler of the refuge staff retrieved a crippled individual and placed it in the headquarters display enclosure.

Other known observations over a wide area would suggest an extension of wintering range rather than accidental occurrences at Salton Sea. Mr. William Anderson also reports six at Los Baños State Refuge on December 23, 1952. One was checked in a hunter's bag at South City Gun Club near Dos Palos, California. In mid-January, two were seen with a flock of Cackling Geese near Los Baños. Warren Pulich reported an occurrence at Havasu Lake National Wildlife Refuge, Parker, Arizona, in 1950 (Condor, 52, 1950:90). Grinnell and Miller (Pac. Coast Avif. No. 27, 1944:71) state that the "southernmost definite record station [in California is] Bolsa Chica Club, near Newport, Orange County, November 10, 1900." Also, they had no records "for any locality east of Sierran divides."—EDWARD J. O'NEILL, *Fish and Wildlife Service, Brawley, California, April 28, 1954.*

Ross Goose in Texas.—I have recently had the privilege of examining at the taxidermy studios of W. A. Mayer, Dallas, Texas, a Ross Goose (*Chen rossii*) which had been mounted for the collection of Mr. T. T. Waddell, State Game Warden at Eagle Lake, Colorado County, Texas. By letter of March 27, 1954, Mr. Waddell has informed me that this bird was killed on January 4, 1954, 11 miles southeast of Eagle Lake in Wharton County, Texas, by Mr. Frederick Pearson of San Antonio who was on this occasion hunting in the company of Mr. Waddell. Mr. Waddell, an acute observer of water fowl as well as other birds, further informs me that during the past season he saw at least two more of these geese in the same general area. So far as I am aware, this constitutes the first recorded occurrence of the Ross Goose in Texas. The specimen, apparently a male, measures as follows: wing, 390 mm.; culmen from base, 42 mm. The characteristic "wartiness" at the base of the bill is very much in evidence.—F. W. Miller, *Dallas Museum of Natural History, Dallas, Texas, April 16, 1954.*

Molothrus ater ater in Arizona.—While driving through Willcox, Arizona, just before sunset, December 10, 1951, Dickerman and Harold E. Broadbooks saw a mixed flock of blackbirds and Starlings (*Sturnus vulgaris*). Desiring to obtain Starling specimens, Dickerman fired once into the top of a leafy tree where a flock had alighted, securing one Starling and seven Brown-headed Cowbirds. The latter were found to vary considerably in size, and on comparison with specimens in the collection of the junior author, four of them proved to be *M. a. ater*, a form new to the Arizona fauna.

Five of the Cowbirds were males. Two *ater* measured, respectively, wing 110 and 109, tail 74 and 73. Two immature *obscurus* measured, respectively, wing 101 and 100, tail 68.3 and 70.5. The last male, an immature one, proved to be *obscurus*, somewhat intermediate toward *ater*, measuring wing 103.5 and tail 70.7. Its bill proportions were not distinctive of either race. Comparison with specimens in the collection of Louisiana State University indicates that it is not thick-billed enough to be called "*buphilus*." It is rather similar to males from the Guadalupe Mountains, Texas.

Both of the females taken were *ater*. They measured, respectively, wing 99.2 and 98.3, tail 66.4 and 69.5. Collections in the vicinity of Tucson in the fall of 1952 and periodic trips to the Willcox region that winter produced no additional specimens of *M. a. ater*.

A series of nine female *obscurus* was taken during the fall of 1952 to determine the true color characters of fresh-plumaged female *obscurus*. These proved to be rather different from those ascribed to *obscurus* in current literature, which is based mainly on Grinnell's description of *M. a. artemisiae*. The northwestern race was described almost simultaneously by Bishop (Auk, 27, 1910:61) and Grinnell (Univ. Calif. Publ. Zool., 5, 1909:276). Both correctly stressed its larger size and more slender (that is, less deep) bill. Grinnell also illustrated a more compressed bill which does not hold constant in our material. But Grinnell likewise advanced color characteristics in the female which he stressed as more important and as linking *artemisiae* to the much smaller *obscurus*.

Of *artemisiae* we can say little, having seen few females and those not in fresh plumage. It appears to be at least as dark and as heavily streaked as *ater*. The differences noted by Grinnell are quite evident in comparing certain late April *ater* with April *obscurus*; but the New York birds are badly soot-stained and two fresh specimens of *ater* have characters about the reverse of those stated by Grinnell! That is, their throats are purer white and in stronger contrast with their chests than in *obscurus*. This whiteness of throat is also evident in a juvenal male from near Whiteriver, Arizona, with the proportions of *artemisiae*; but juvenal feathers tend to fade badly and we are loath to stress this comparison. At any rate, good unfaded *obscurus* is by no means "of a drab color throughout, very much paler and more clay color on the throat, whereas the eastern birds are slaty hair brown, with less abruptly contrasted grayish throat." The crown of *M. a. ater* appears to be darker and grayer, and the back slightly grayer, but not darker than in *M. a. obscurus*.

We wish to acknowledge the assistance of Kenneth C. Parkes, who made comparisons of the Willcox birds with the series of *ater* in the collections at Cornell University.—Robert W. Dickerman, *Arizona Co-operative Wildlife Research Unit, University of Arizona, Tucson, Arizona,* and Allan R. Phillips, *Museum of Northern Arizona, Flagstaff, Arizona, April 21, 1954.*

Second Records of the Swamp Sparrow and Brown Thrasher in Utah.—Two rare birds in Utah's avifauna heretofore known only on the basis of single records from southern Utah are the Swamp Sparrow (*Melospiza georgiana*) and the Brown Thrasher (*Toxostoma rufum*). Recently Boyd Shaffer of the Tracy Aviary in Salt Lake City has obtained a specimen of each of these, the data for which are herewith reported.

A single specimen of the Swamp Sparrow was taken by Yarrow and Henshaw of the Wheeler Survey from a large flock of *Zonotrichia* sparrows near Washington on the Virgin River, October 23, 1872 (Henshaw, Rept. Geog. and Geol. Expl. and Surv. West 100th Mer., 5, 1875:385). The second specimen was taken on February 20, 1952, at 30th South and West Temple, Salt Lake City. It was a lone bird occurring in a streamside thicket and behaving much like a Song Sparrow. The specimen was mounted and added to the collection of Fringillidae at the Tracy Aviary in Salt Lake City. The circumstance that both examples of this sparrow are winter records suggests that the status of this species in the state is that of a rare winter visitant.

A Brown Thrasher was repeatedly trapped in Zion Canyon, Washington County, from December 6 to 9, 1935, and when its identity was established it was collected on December 9, according to Grantham (Condor, 38, 1936:85). It was a female in worn plumage. The specimen is in the Zion National Park Museum. On June 25, 1953, Shaffer found a Brown Thrasher at the Tracy Aviary in Liberty Park, Salt Lake City. Realizing the rarity of the bird in Utah the specimen was taken and presented to the University of Utah. It proved to be a male with testes in breeding condition, measing 10 × 6 millimeters. Its plumage was generally worn and frayed but a few new feathers suggest the inception of the annual molt.—WILLIAM H. BEHLE, *University of Utah, Salt Lake City, Utah, May 1, 1954.*

Franklin Gulls Riding Whirlwind and Feeding.—At about 2 p.m., August 27, 1953, while working five miles west of Pierce, Colorado, I observed a flock of approximately thirty Franklin Gulls (*Larus pipixcan*) riding the outskirts of a whirlwind. These birds were noted to be capturing something in the air and closer observation with a 7 × 35 binocular revealed that they were taking grasshoppers or similar-sized insects caught in the wind currents. The birds were sailing around on the wind stream at what appeared to be a fast rate of speed, in a close circle and were flapping their wings very little. They were seen to ride this whirlwind for about one-quarter mile where they apparently tired of the fast ride and left it. They then resumed normal cruising flight and feeding activities over the nearby wheatland.—CLARENCE A. SOOTER, *Greeley, Colorado, March 4, 1954.*

Additions to the Avifaunal Record of Point Lobos, California.—Grinnell and Linsdale (Carnegie Inst. Publ. 481, 1936:33-132) observed and recorded 147 species of birds at Point Lobos, Monterey County, California. In addition they mention seven others noted by other observers, or by them but outside the 1934–35 field period. Four additional species have been recorded by Williams (Condor, 39, 1937:229) and Legg (Condor, 55, 1953:162, 219). During my residence of two years and nine months at Point Lobos Reserve, 1951–1953, I have had opportunity to record the following 25 species not previously recorded there.

Diomedea nigripes. Black-footed Albatross. On June 3, 1951, a dead one was picked up at Pebbly Beach. It was identified by Charles G. Sibley.

Fregata magnificens. Man-o'-War Bird. On January 12, 1953, at 3 p.m., one was soaring over Carmel Cove. Laidlaw Williams and I observed the bird for approximately half an hour before it flew off to the west and was not seen again. A white head and white underparts identified it as a young individual.

Elanus leucurus. White-tailed Kite. One reported by Francis Williamson on September 2, 1952, over the Cypress Grove parking lot entered the Reserve from the east and in about five minutes departed by the same route.

Fulica americana. Coot. This species, common on the Carmel River, was unrecorded at Point Lobos until October 16, 1952. At that time my attention was called to one walking down the Reserve road by Ranger Grady. The bird did not appear to be wounded but was apparently confused by its surroundings.

Catoptrophorus semipalmatus. Willet. Willets were seen twice during my stay at Point Lobos. On December 25, 1952, two were watched on the sandy beach at Carmel Cove and on March 4, 1953, five spent all day resting on the flat rocks at Pebbly Beach.

Limnodromus griseus. Dowitcher. On September 10, 1952, Williams and I saw one of this species at the water's edge at Pebbly Beach. On March 30, 1952, two spent the day in company of a Brant (*Branta nigricans*) at the same area.

Limosa fedoa. Marbled Godwit. On September 17, 1952, Williams and I saw one in flight near the Cypress Grove.

Crocethia alba. Sanderling. Though common along the coast, this species has not been recorded heretofore on the Reserve. On October 30, 1952, five were observed probing the sand at Gibson Beach. On November 15, 1952, one was walking over rocks and picking at algae at Pebbly Beach with 35 Black Turnstones (*Arenaria melanocephala*).

Ptychoramphus aleuticus. Cassin Auklet. Cassin Auklets were recorded five times. Their presence doubtless was due to severe storms or oil-soaked plumage. At various beaches dead, oil-covered individuals have been found: January 13 (seventeen), 24 (one), 31 (one), all in 1952, and January 11, 1953 (one). One auklet was found alive in shoreline vegetation on January 14, 1952.

Cerorhinca monocerata. Rhinoceros Auklet. Like the Cassin Auklet this species occurred in the Reserve due to storm conditions: January 13 (3), and December 10 (1), in 1952; March 2 (1), and March 10 (4), in 1953. On July 30, 1952, Williams and I saw one swimming near Bird Rock.

Phalaenoptilus nuttallii. Poor-will. Observations, mostly of single individuals, were made on November 17 and 20 in 1951, and March 5 and 26, August 17, and October 15, 17, and 28, in 1952.

Stellula calliope. Calliope Hummingbird. On April 18, 1953, I watched for 15 minutes a male feeding on Castilleja blossoms near Cypress Grove. A few days later a male of this species was collected at Carmel Highlands about a mile from the Reserve.

Ixoreus naevius. Varied Thrush. On February 22, 1952, one was seen on a lawn. Single individuals were also seen on February 28 and on March 17 and 27, 1952.

Regulus satrapa. Golden-crowned Kinglet. This species was seen in considerable numbers throughout the winter of 1952–53, the first date being October 24, 1952, and the last January 15, 1953.

Bombycilla cedrorum. Cedar Waxwing. Francis Williamson saw seven in the pines near headquarters on May 22, 1952.

Vireo bellii. Bell Vireo. On May 24, 1953, one of this species was heard and seen at close range in a live oak at the southeast edge of the Reserve.

Vireo solitarius. Solitary Vireo. On May 26, 1953, Williams and I heard and saw one near headquarters.

Vireo gilvus. Warbling Vireo. In a live oak thicket near headquarters Williams and I saw one on May 26, 1953. On this date a low pressure area existed in this region and many migrating warblers and other birds were in the trees.

Vermivora ruficapilla. Nashville Warbler. On April 30, 1953, two of these were seen on and about the top of *Baccharis pilularis* in a meadow area.

Molothrus ater. Cowbird. On July 15, 1952, Williamson, James Duncan and I observed a Western Flycatcher feeding a fledgling Cowbird in a small willow in the center of the pine woods. One was seen in pines at the foot of Rat Hill on May 31, 1953.

Piranga ludoviciana. Western Tanager. On June 10, 1953, Williams and I heard one singing in pines near the entrance to the Reserve.

Pheucticus melanocephalus. Black-headed Grosbeak. Two males were seen on May 5, 1953.

Spinus tristis. American Goldfinch. On May 14, 1952, a pair was seen on the slope east of Gibson Beach and on May 28 another pair in *Baccharis* near Cannery Point. On November 9, 1952, two males in winter plumage were feeding on tarweed (*Hemizonia*) near headquarters.

Pipilo fuscus. Brown Towhee. First seen by Catherine Legg near headquarters on July 15, 1952; one of this species spent three days there.

Chondestes grammacus. Lark Sparrow. One was seen in a picnicking area on April 15, 1951.—KEN LEGG, *Natural Bridges State Park, Santa Cruz, California, September 28, 1953.*

Record Families of Swainson Thrush.—Bent (U. S. Nat. Mus. Bull. 196, 1949:163-188) gives the number of eggs in sets of various races of the Swainson Thrush (*Hylocichla ustulata*) as three to five, with sets of the latter figure apparently rare. Several other authorities all list similar data. On July 12, 1952, in Michael's Draw, four miles north of Libby, Lincoln County, Montana, I discovered the nest of a Swainson Thrush containing seven young more than half grown. The site was two feet above ground at the edge of a wild rose thicket, adjoining alder stream border, in a forest of Douglas fir-western larch at the bottom of a ravine. The crowded nestlings, not yet of an age to desert the nest, crouched low, but filled the deep cup to the brim as I touched each on the head with a finger

while twice counting them off. One parent fed the nestlings soon afterward, remained close by and was readily identified. This was at approximately 2400 feet in the Transition Zone, throughout which the species is an abundant summer resident in suitable habitat.

On July 15, 1954, another nest was located three and one-half feet up in a low mountain alder of the inner cottonwood-willow stream border on Granite Creek four miles south of Libby. It held two eggs. On July 27, thinking there was yet time to obtain a photograph of the completed set, I stopped with the camera at the nest site. Both birds were present. One was observed at length from a few feet. Unexpectedly, however, the nest contained husky young three or four days old, and there were only two of them. Comparing this with the number of nestlings noted on July 12, 1952, and assuming there had been no interference with the 1954 nesting, it is clear that variation in clutch size in this species is greater than heretofore recorded.—JOHN L. BLACKFORD, *Libby, Montana, July 29, 1954.*

Unusual Barn Owl Nest Location.—On May 8, 1951, in a *Salicornia* marsh at Playa del Rey, Los Angeles County, California, I flushed a Barn Owl (*Tyto alba*) from its nest in the ground. Closer inspection disclosed the bird had taken over a box 2 feet wide, 3 feet long and 2 feet deep. The box, sunk into the ground and partially covered with *Salicornia*, contained five young owls almost ready to leave their nest, as shown in the accompanying figure. The nest was deserted in 1952 because heavy rains flooded the box. Another check on February 24, 1953, showed an owl again present in the box and incubating seven eggs.—RAY QUIGLEY, JR., *Whittier, California, February 1, 1953.*

Fig. 1. Nest of Barn Owl in *Salicornia* marsh.

NOTES AND NEWS

At the recent meeting of the American Ornithologists' Union in Madison, Wisconsin, the Brewster Award was made to James Bond for his writings on the birds of the West Indies. The Marcia B. Tucker Student Award was made to Robert K. Selander. Elections resulted as follows: Honorary Fellows, Finn Salomonsen and Yoshimaro Yamashina; Corresponding Fellows, Lars von Haartman, Rene Verheyen, Constantine W. Benson, and F. Bourliere; Fellows, W. Earl Godfrey, Joseph Hickey, Howard L. Mendall, and Charles Vaurie; Elective Members (formerly designated Members), Herbert H. Beck, E. Alexander Bergstrom, Irvin O. Buss, Nicholas E. Collias, Ernest P. Edwards, Brina Kessel, Chester C. Lamb, Louise Lawrence, Henry M. Stevenson, and Howard F. Young; new Councilmen, Ira N. Gabrielson, George H. Lowery, Jr., and Roger Tory Peterson. Current officers otherwise were reelected.

Cost of publishing tabular material in the article on the Greenland Wheatear has been contributed by George M. Sutton.

PUBLICATIONS REVIEWED

THE GIANT CACTUS FOREST AND ITS WORLD. By Paul Griswold Howes. Duell, Sloan and Pearce, New York, xii-xviii + 243 pp, frontispiece, 1 color plate, 186 figures. 1954. $7.50.

To an old Sand Rat who fell in love with the Arizona desert 60 years ago, this profusely illustrated book is like looking over the "old family album" except that its photographs are all done in the sharp technique of modern outdoor photography. To one who is a stranger in desert country, there will come the strong call to go and see it, to smell it, to breath it. For the Condor reader there is a chapter of friendly gossip about the birds—truthful gossip on the whole except that one might challenge the statement that the Pigmy Owl is smaller than the Elf Owl. The museum calipers show a close approximation in size but to one who has handled many of each species in the flesh (or has cleaned skeletons), the Elf appears as more truly elfin—a really fragile creature.

But what bird man is satisfied with a "bird in the hand"? A bird in the bush is worth twice as much to the nature-minded modern. That bush may be a cholla or a saguaro as this entertaining book points out. Along with the bush go the bird's neighbors, vertebrate and invertebrate. Even the soil, the sun and the meager rainfall help to frame the picture the author paints—and it is a pleasant picture.

There are many questions left unanswered but unanswered questions are strongly stimulating.

Meanwhile the wind sings through the spines of the tall giant cactus (an incredible creation), the creosote and sage scent the air by day, the night-blooming cereus by night. The silence at dawn, the sun at noon, the purple shadows at sunset, all are brought to mind afresh by reading "The Giant Cactus Forest and its World."—LOYE MILLER.

COOPER SOCIETY MEETINGS

NORTHERN DIVISION

JUNE.—The monthly meeting of the Northern Division was held on June 3, 1954, at the University of California, Berkeley, California. The following names were proposed for membership: Robert J. Bennett, Astoria, N.Y., by D. W. Johnston; and Andreas B. Rechnitzer, La Jolla, Calif., by A. H. Miller.

R. I. Bowman reported on a visit to the Farallon Islands on May 18, 1954. During the 1½ hours on the most eastern island, where the Coast Guard Station is located, the following species were noted. The Western Gull, the only nesting larid, was the most abundant species. Nests were made of sections of the yellow-flowered composite *Baeria maritima*, which is extremely common on the island. Brandt Cormorants far out-numbered Pelagic Cormorants, and no Double-crested Cormorants were seen. On the gently sloping terraces of the north side of the island there was a colony of Brandt Cormorants containing over 150 nests, many of which held eggs, 1 to 5 in number. Pelagic Cormorants were seen on nests at two very steep bluffs on the north coast. Also on the north coast were two small nesting colonies of Common Murres, each of about 15 birds. No Rhinoceros Auklets were seen. G. W. Treichel, another member of the party, noted two Tufted Puffins in flight. Pigeon Guillemots were extremely abundant in the numerous holes among the rocks or under boards.

Mr. Donald L. McLean of the California Division of Fish and Game, discussed "Introductions of Birds and Mammals in California."—ROBERT I. BOWMAN, *Acting Secretary*.

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For Sale—Michigan Bird Life, Barrows, $2.50; Birds of Virginia, Bailey, $2.00; A.O.U. Check-list of 1910, $2.00; Life Histories N. A. Pelicans and Petrels, Bent, $5.00; Life Histories N. A. Shorebirds, part I, Bent (plates water damaged), $1.00; Birds of California, Wheelock, $1.00; Ornithology of California, Cooper (rare, newly bound), $7.50; Pacific Coast Avifauna, Nos. 1–2, 5–13 inclusive, 15–16 and 21, the lot, $10.00; Birds of Ethiopia and Kenya Colony, Africa, part I, Friedmann, $2.00; Monograph of Goatsuckers, Oberholser, $1.00; California Mammals, Stephens, $3.00; East African Mammals, parts 1 and 3, Hollister, $2.00; Catalogue Type Specimens Mammals, Lyon and Osgood, 75¢; Natural History of Ground Squirrels, Grinnell and Dixon, 50¢; Mammals of Adirondack Region, Merriam (autographed), $5.00; Natural Resources of Lower California, Nelson (autographed), $15.00; postage extra on all items.—Laurence Huey, *Natural History Museum, Balboa Park, San Diego, Calif.*

For Sale—Lure of the Open, edited by Joe Godfrey, Jr., and Frank Dufresne (new limited edition), $12.50 (original price $17.50); 450 pages of sports lore, with all major North American species of salt and fresh-water fish, game birds and mammals illustrated and described; bound in hand-tooled mission leather.—Don Spencer, *88 Secor Road, Scarsdale, N.Y.*

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January 1, 1954

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